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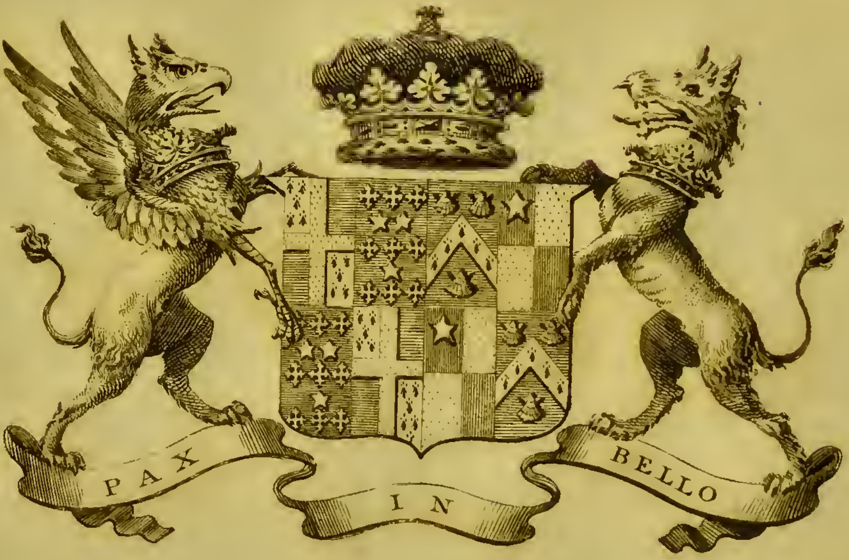

LEEDS.

THE
OUTLINES
OF THE
VETERINARY ART.

VOL. I.

55173

THE *OUTLINES* OF THE VETERINARY ART; OR, THE *PRINCIPLES OF MEDICINE:*

AS APPLIED TO

A KNOWLEDGE OF THE STRUCTURE, FUNCTIONS, AND OECONOMY OF THE HORSE, THE OX, THE SHEEP, AND THE DOG, AND TO A MORE SCIENTIFIC AND SUCCESSFUL MANNER OF TREATING THEIR VARIOUS DISEASES.

The whole illuſtrated by Anatomical Plates.

BY DELABERE BLAINE,

PROFESSOR IN ANIMAL MEDICINE.

> Quod veterinaria medicina formaliter una eademque cum nobiliore hominis medicina ſit materiæ duntaxat nobilitate differens.
>
> INGRASSIUS.

IN TWO VOLUMES.

VOL. I.

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AND T. BOOSEY, BROAD-STREET.
1802.

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TO THE

KING's

MOST EXCELLENT MAJESTY.

SIR,

YOUR *Majeſty's gracious Permiſſion ſo readily granted me to dedicate my laſt Work to you, emboldens me to lay this alſo at your Majeſty's feet: and if that was thought in any meaſure deſerving of Royal Approbation, I hope this will not be eſteemed leſs ſo, as having for its object the farther extenſion of a Subject as important as it is become popular.*

With the utmoſt deference and reſpect, I beg to ſubſcribe myſelf,

YOUR MAJESTY's

Moſt devoted and moſt faithful

Subject and Servant,

DELABERE PRITCHETT BLAINE.

19 Golden Square.

INTRODUCTION.

If the animals, domeſticated by man, are eſſentially neceſſary to his comfort and convenience, no apology need be offered for attempting to reduce into a ſyſtem the arts of preſerving them in health, and of removing their diſeaſes: both of which muſt be founded on a knowledge of the ſtructure and functions of the animals in queſtion; and it is theſe, therefore, that form the ground-work of what is called the *Veterinary Art*; which may be defined, to be a knowledge of the means whereby preſent health is preſerved, and loſt health recovered in domeſtic animals; or, according to the ſtrict derivation of the term, in beaſts of burden.

The deplorable ſtate of this art in Great Britain, and of that grand branch of it, called *Farriery*, has been animadverted upon by every one who has written on the ſubject; and though, in other countries the eſtabliſhment of ſeminaries for the expreſs purpoſe of teaching it ſcientifically and ſyſtematically, has appeared to be leading the way towards a better mode of practiſing it, yet in real improvements, it does not appear that theſe countries are much more fortunate than ourſelves.

The principal hindrance to the advancement of this branch of the healing art, has been its total and univerſal confinement in the hands of perſons proverbially ignorant. Cuſtom reconciles the groſſeſt abſurdities; and hence, though the value of the animals in queſtion, and particularly of the horſe, is a theme that has exerciſed in every age the pen of thouſands, yet the knowledge of the means of preſerving them in health, and of curing their diſeaſes, has been regarded as a ſubject beneath the dignity of a man of education; and the practice as derogatory to the character of a gentleman. Thus every improvement that has been witneſſed, made its way by ſtealth, and as it were, crept into notice; uſually by the exertions of ſome enlightened phyſician or ſurgeon, as Gibſon, Braken, Bartlet, and Oſmer.

But, at length, ſuperior to vulgar prejudices, and aware of its great utility and importance, mankind are content to conſider this among the liberal arts, and to regard the profeſſion and practice of it as no longer incompatible with the pretenſions of the ſcholar, or the rank of a gentleman: and it may be expected, that from the eſtabliſhment of a Veterinary College, and the exertions of its Eléves, that it will not only riſe in its dignity, but that its utility will become daily more and more evident.

Yet a conſiderable time muſt elapſe before theſe improvements, by means of a college, can be made general, or before perſons properly inſtructed can be ſtationed over the remote parts of the country; and in the mean time any work that taught this branch of the healing art ſyſtematically, and from its foundation, muſt prove highly important and beneficial to the world at large; and there are few claſſes of mankind but muſt participate in the advantages to be derived from it. The poſſeſſors of horſes of every deſcription would be intereſted therein; particularly thoſe of rank and fortune, whoſe leiſure might permit them to become acquainted with the fundamental principles of the art, by the acquiſition of which, they would be enabled to direct in caſes of emergency for themſelves. Medical men, in general, are intereſted in ſuch a production, for their opinion is often required on caſes in which analogy totally fails, but in which they would be willing to be uſeful.

To farriers, it is needleſs to ſay how valuable ſuch a work would prove: the awakened attention of the public to the groſs impropriety of their general practice, has convinced many of them of the neceſſity of receiving inſtruction; but which the nature of their ſituation prevents numbers of them from ſeeking at the ſeminary eſtabliſhed for that purpoſe.

To diffuſe, therefore, generally the benefits of a ſcientific inveſtigation of this ſubject; and to teach that art among all ranks of perſons, which the Veterinary College is attempting among individuals, is the intention of the preſent work: and it is evident, that in ſuch an undertaking a very wide field of information muſt be entered into; a ſimple account of the form of the body in health, and of the mode of treating it under diſeaſe, will not conſtitute a whole outline of this extenſive ſubject; for in an art, the firſt principles of which even, are but emerging from obſcurity, the mind muſt gradually be prepared to underſtand its more complex parts, by a knowledge of its collateral branches. To this end, the nature, the origin, and progreſs of the healing art in general muſt be conſidered, and the relations the ſeveral branches of it bear to each other. The preſent theories muſt be alſo taught, and the various other ſubordinate parts weaved into a gradatory ſcale, by which the mind may be led to reaſon and to think medically. The comparative formation of the ſeveral forms living matter aſſumes, and the individual ſtructure of thoſe animals, called domeſtic, muſt be in turn examined. This leads to an explanation of the laws of the animal œconomy, and the functions of the parts deſcribed, which will open the mind to a proper conception of thoſe morbid changes producing diſeaſe, and ſuggeſt the means of counteracting, or removing their effects.

It may perhaps be ſuppoſed, that I wander too far, in the introduction of ſuch varied matter, as will be found in the following pages; but it muſt be remembered, that I am teaching the practice of veterinary medicine fundamentally. This work is not intended to give merely a certain number of prevalent diſeaſes, with a proportionate number of approved receipts for the cure: for it is in a great meaſure owing to this ſyſtem of writing, the art has advanced no farther. It is deſigned to draw farriers, by degrees, to think and reaſon on the ſubject they profeſs; and hence to act not from a receipt book, but from well-grounded principles. Theſe are the conſiderations that have ſtimulated me to the wide field I have entered into; and from this it will be perceived, I have undertaken no eaſy taſk; how I have accompliſhed it, a generous public muſt determine: but when the preſent ſtate of the ſcience is taken into conſideration, how very few authorities I could borrow from; with the difficulty of accumulating information on ſubjects ſo numerous and diffuſe, I hope I may claim ſome indulgence, and be permitted to eſcape from too ſevere criticiſm.

The ſubject-matter I have divided into three grand diviſions. The firſt of theſe compriſes what may be termed the collateral branches of the art, commencing with a General Hiſtory of Medicine from its origin to the preſent time; with the leading theories that have appeared, and thoſe at preſent in common reception: and though in this I may be deemed irrelevant, yet when the connection, that all the branches of the healing art have with each other is conſidered; and particularly that this branch has ſprung from, and muſt grow with human medicine as its parent ſtock, this hiſtory will then be found to lead to a proper conſideration of the general ſubject. I have next proceeded to a Hiſtory of the Veterinary Art in general; to which ſucceeds a particular account of its ſtate, and improvements in this country, by which the reader will be enabled to judge how far we ſtand removed from other nations in this particular, and what they may be ſuppoſed to have borrowed from us, or we to have learned from them. From theſe hiſtories the general properties of matter are examined, and its diviſion into living and dead. Dead matter is governed by chemical laws, and living matter is likewiſe, much of it, under its guidance; hence we are led to a general hiſtory of this branch of ſcience, and an explanation of ſuch of its terms as will frequently occur in the progreſs of this work. A conſideration of living matter introduces an out-line of comparative anatomy, or a compariſon between the ſtructure, functions, and œconomy of the various animated forms ſurrounding us.

The ſecond diviſion of the work offers a detail of the parts of the body of the moſt noble among the quadrupeds domeſticated to our uſe, the *horſe*. The anatomy of this animal forms a key to the knowledge of the others, and the deſcription is blended with a phyſiological account of the functions and œconomy of the parts; and as the knowledge of the extremities forms one of the moſt eſſential points in the practice of farriery, I have deſcribed them ſeparately, that the practical remarks on them might come into one point of view. The parts treated of have been moſt of them taken from my own diſſections; yet I can by no means aſſert they are all critically correct: if it has taken ſo many centuries to gain a knowledge of the human frame, it cannot be ſuppoſed an eaſy taſk at once to deſcribe ſo complex an animal as the horſe. Nevertheleſs, I hope no glaring errors will appear, and wherever I have had doubts on any ſubject, I have faithfully recorded them, as well as my authorities, when I have made uſe of the information of others.

I have illuſtrated the anatomical part of my work with plates, as I deem them of the greateſt poſſible aſſiſtance to the acquirement of a knowledge of anatomy, particularly where recourſe cannot be had to the ſubject itſelf. The engraving of theſe plates is not ſo good as I intended it ſhould be, but I did not receive altogether the aſſiſtance I had reaſon to expect. As figures, however they may want beauty, yet as being all drawn by myſelf from the dead ſubject, I can venture to aſſure my readers, they are tolerably correct. In the parts repreſented, I have endeavoured to form ſuch an arrangement as that thoſe moſt important, either in elucidating the œconomy of the animal, or as more immediately concerned in the practice of the art, may be particularly brought forward and repreſented; and in this reſpect, I hope I have been rather fortunate in my ſelection.

I have divided the ſubject both of this and the former diviſion, into ſections. Each ſection of this diviſion comprehends a particular branch of anatomy, as Section XV. treats of Splanchnology, or the Deſcription of the Viſcera. I have made uſe of the terms that are uſual in human anatomical deſcriptions, but I have in the Index, as well as throughout the deſcription, introduced the ſynonima of the farriers; and, it will appear, whenever it has fell to my choice, I have uſed Engliſh terms.

The third diviſion is allotted to the practical part of the veterinary art, or a deſcription of the diſeaſes of the *horſe*, *ox*, *ſheep*, and *dog*, and the mode of cure; and it will be ſeen, I have firſt treated of what may be called its medical part, that is ſpeaking with analogy to the human; the firſt comprehends that practice that falls under the cognizance of the phyſician; and the ſecond, that which is uſually confined to the ſurgeon. I have likewiſe attempted ſomething like a claſſification of diſeaſes; not, I am convinced, ſo perfect as it may be, but ſuch as I conceive the preſent ſtate of the ſcience beſt admits of: had I attempted a more ſtrictly noſological arrangement, I might have bewildered the uninformed, and perhaps have loſt myſelf: but ſome claſſification of diſeaſes has great advantages, for as ſome remote parts of the body follow the ſame laws in ſtructure and œconomy, ſo they are liable to ſimilar diſeaſed affections; the inflammation of mucous membranes produce ſimilar appearances in many reſpects, whatever part of the body it takes place in. The inflammation of the cellular membrane producing phlegmon, and abceſs, is the ſame whether it occurs on the cheek, or on the buttock; hence a knowledge of theſe diſeaſed affections can be rendered more comprehenſive by their being claſſed under one head, than when ſuffered to remain ſcattered through all the varieties to which, from the different parts affected, they have hitherto been.

This claſſification forms twenty heads or claſſes; ten of which include the medical part of the art, and ten belong to the ſurgical; after which, the operations that occur in farriery are introduced; and that the treatment of diſeaſes might be rendered plain and intelligible to thoſe not in the habits of reading medical works, I have, wherever I thought it neceſſary, added a recapitulation of the ſymptoms, and mode of cure, at the end of the complaint, diveſted of the reaſoning and probable cauſes; by which means I offer to thoſe who ſtudy from the foundation all they can wiſh as to cauſe and effect, and yet do not deprive thoſe who only look into this work as a vade mecum, of the benefit of a conciſe liſt of directions for the cure of any particular complaint.

It was my intention to have been much more diffuſe on the head of diſeaſes, but the firſt and ſecond parts of the work exceeded my expectation ſo much in the room they occupied, that I was forced to compreſs this part much; and for this reaſon likewiſe, I have been much more conciſe on the diſeaſes of other animals, particularly on thoſe of dogs, than I had propoſed; nevertheleſs, I hope, I have added ſomething to the information on theſe ſubjects.

The veterinary art is but yet in its infancy, and if even the moſt enlightened among its practitioners was only to offer what he had himſelf witneſſed, ſmall would be his offering; but in its preſent ſtate, every ſtore muſt be ranſacked, and every ſource drawn from. Whoever has the patience to follow me through the following pages, will find I have not been idle, and that there are few works either in our own, or other languages, that have eſcaped me, from which it was poſſible I could derive any aſſiſtance: nor have I neglected oral information; I have ſought the communications of the moſt enlightened practitioners, both in human and animal medicine; and I here moſt gratefully thank them for the hints I have gained from them.

Independent, likewiſe, of my own experience and practice on the diſeaſes of animals, which has been at various times extenſive, I have embraced every opportunity of ſeeing the ſick of other practitioners, and of viſiting ſome of the beſt regulated infirmaries at preſent eſtabliſhed; and this not only throughout England, but in ſome other countries. I have only to regret, that I have not the honour to be on terms of intimacy with the preſent Profeſſor of the Veterinary College; if I had, it would have been in my power, probably, to have made this work more worthy the acceptance of the public, but I have endeavoured to offer the general opinions he entertains, and the improvements he has introduced; in which I have been at pains to do him ample juſtice: but where I have in any inſtance miſunderſtood either him, or the numerous authorities I have introduced; the errors will, I hope, be attributed to the right cauſe, and not to a wilful miſrepreſentation: and wherever I have brought forward facts, or uſed either terms or arguments, that have been before made uſe of, that I beg I may not fall under the ſtigma of plagiariſm; but that it may be ſuppoſed, I was either led into the ſame train of reaſoning, or that I forgot to mention my authorities.

I have to make many apologies to the claſſical reader for numerous inaccuracies, and the want of a certain ſmoothneſs in ſtyle, that requires laboured attention, and conſiderable leiſure, particularly on a ſubject that does not naturally admit of much embelliſhment: but while theſe ſheets were preparing for the preſs, my time was much taken up, not only by my private practice, but likewiſe by the arrangements I was engaged in forming for the veterinary and ſporting part of Dr. Rees's New Cyclopædia, as well as ſome other literary calls. Theſe circumſtances forced me frequently to correct haſtily, by which not only is the ſtyle of the following ſheets frequently leſs ſmooth, but ſometimes the diction leſs correct than it otherwiſe would have been. I muſt, therefore, beg the generous reader's indulgence, and an attentive reference to the erratas.

I have introduced a very copious index, that by this means thoſe ſubjects that are otherwiſe disjointed, may come into one point of view. By this, the whole that has been ſaid on any article throughout the work, appears at once. By this, likewiſe, the reader will be enabled to find immediately any ſubject he wiſhes, and this under any term that is familiar to him, as the ſubjects are arranged under all the names in common uſe, as well received, as claſſical and ſcientific. Whenever a technical name, or any article is not eaſily met with in the table of contents, by the term in common uſe among farriers; by a reference to the index it may be found.

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ERRATA.

ERRATA.

Page. Line.
9 1, *for* which was *r.* which were
12 7, *for* amendations *r.* emendations
35 19, *for* anſi *r.* ainſi
42 28, *for* it *r.* they
56, 27, *for* wrote *r.* written
146, 15, *for* are formed *r.* is formed
186, 4, *for* panſe *r.* panſe
274, 25, *for* condoloid *r.* condyloid, *and wherever it occurs*
282, 25, *for* die *r.* died
284 4, *for* inciſives *r.* inciſors
286, 5, *for* ſtrengthen, *r.* ſtrength
322, 9, 11, 12, 13, *add* the
323, 15, *after* on *add a* comma
— *laſt line, omit* Bourgelat
333, 29, *for* foſſa *r.* foſſæ.
334, *for* aſtragulus *r.* aſtragalus *and* wherever it occurs
343 6, *after* is *r.* comparatively

Page. Line.
349, 22, *for* cotoloid *r.* cotyloid *and wherever it occurs.*
405, 7, *between* of *and* tail *inſert* the
418, 8, *for* adductor *r.* abductor
457, *for* thoraic *r.* thoracic *and wherever it occurs*
482, 3, *for* giving *r.* given
487, 3, *for* is *read* are
493, 27, *after* head *r.* of
495, 8, *for* maſtication *r.* circulation
502, 4, *for* biliari *r.* biliarii
511, 22, *for* pancratic *r.* pancreatic
516, 25, *for* appears *r.* appear
526 17, *omit* that
— 26 & 30, *for* Achilles *r.* Achillis
539, 29, *between* of *and* larynx *inſert* the
549, 12, *omit* it
559, 3, *for* proſtrates *r.* proſtates

HISTORY

OF

MEDICINE.

SECTION I.

A HISTORY of medicine is connected with the veterinary art; becauſe all the improvements made in it have been derived from a previous acquaintance with this great branch of philoſophy. Moſt of thoſe who have been eminent veterinarians have been firſt phyſicians or ſurgeons; and in early ages, there is reaſon to ſuppoſe, the two arts were very commonly united in the ſame perſon. The practice of the healing art muſt have been nearly coeval with the world; when men became ill, recovery was anxiouſly longed for, and every means made uſe of to find a remedy. Antient hiſtory informs us, that ſoon after the flood, medicine was cultivated by the Aſſyrians, Chaldæans, and Babylonians,

lonians, from whence it paſſed into Egypt and Greece, and was particularly cultivated in the Iſlands of Rhodes and Cos.

The improvements in the art originated in chance; men had no ſyſtem, and had formed no experiments; remedies that had proved beneficial were handed down by tradition, and uſeful diſcoveries were written on the paintings, columns, and walls of the temples. As particular perſons ſtudied theſe antient teſtimonies, and made themſelves additions to them, they became reſorted to, and thus became regular practitioners. The gratuities offered on theſe occaſions could not be regarded but with a jealous eye by the prieſts, who, to confine them among themſelves, intermingled their ſuperſtitious rites; from whence aroſe the incantations, charms, and amulets, which form the practice of every people emerging from barbariſm: hence we read in antient hiſtory of the cures of the prieſts in Egypt, the magi, and *bramins* of the Eaſt, and of the druids of Great Britain. But this ſuperſtition itſelf laid the foundation for improvement, for the practice of extiſpicy, or inſpecting the entrails of beaſts for an omen, and more particularly, the embalming their dead, muſt have contributed to the knowledge of the animal frame, and of the appearances of health and diſeaſe; hence, by degrees, we find a regular clinical practice was eſtabliſhed, founded on the knowledge gained by theſe means, and on the prevailing ideas of the times.

Hippocrates was one of the firſt who made phyſic rational, and which he practiſed with the greateſt ſucceſs, and from which he formed that grand body of Greek medicine, which laid the foundation of the *dogmatic practice*, and gained him the illuſtrious and deſerved title of father of medicine.

Hippocrates was cotemporary with Democritus, and was born in the beginning of the 80th Olympiad, 460 years before the chriſtian æra, in the Iſland of Cos. His practice was remarked for its ſimplicity; he obſerved diſeaſes attentively, and reported their progreſs, wiſely avoiding theory where the grounds were ſo few to form them upon; from this he was called the founder of the empirical practice. Celſus ſays of him, *primus ab ſtudio ſapientiæ medicinam ſeparavit.* But though theories were avoided by this great man, obſervations from the noble ſtudy of anatomy were carefully made; for we find that he, in company with Democritus, who, though his cotemporary, is ſaid to have been his teacher, buſily egaged themſelves in the diſſection of brutes: the human body, from the prejudices of the times, was out of their reach; hence all their anatomical inſtructions deſcribed the parts of animals, applied to the human body.

Hippocrates conſidered the body as influenced by a general principle, called *nature. Nature* acts in health and diſeaſe; ſhe acts in health to ſeparate the noxious from the innocuous; when the functions are diſturbed, diſeaſe enſues. Diet and air, he reckons as the principal cauſes of derangement, and this effect, he held, was brought about by an alteration of the humours of the body. In diſeaſe, *nature*, which is the *vis medicatrix naturæ* of more modern times ſtill acts and endeavours to reduce the altered humours to their original ſtate, by concocting the morbid part, and preparing it for expulſion, which forms the criſis of a complaint. The ſtudent ſhould be particularly attentive to this doctrine of concoction, and depuration of the humours, for upon this hinges that great ſyſtem of the *humoural pathology*, that was formed by this illuſtrious antient, and has continued ſo many centuries in full vigour, and is to this day prevalent in many countries. All the writers that have appeared in veterinary medicine, have till the preſent time, conſidered diſeaſes as ariſing from an affection of the fluids of the body, by which ideas their practice has been guided, and hence been inert, and without deciſion. Hippocrates divided diſeaſes into *epidemic*, or thoſe raging in any place affecting numbers at the ſame time. *Endemic*, or thoſe which appear to be peculiar to, and the reſult of ſome particular ſituation: and *ſporadic*, or all the general complaints that are not influenced by the two former diviſions. From the contracted ſtate of knowledge at that period, and from the little acquaintance with chemiſtry, ſimples were moſtly in uſe, aided by vomiting and blood letting; and the general ſyſtem of application was that all diſeaſes are cured by their oppoſites.

The phyſicians that followed him, did not long continue the ſimple and ſafer plan of obſerving diſeaſes, but entangled themſelves in theory, forming the doctrine of the four elements, with the correſponding qualities of heat, cold, dryneſs, and moiſture, which they ſuppoſed accounted for all the changes that took place in the animal body. For a period of 500 years no very eminent character aroſe, nor any popular theory, if we except the mechanical ſyſtem of Aſclepiades, and the union of the empirical and dogmatical practice by Themiſon, which formed the methodic ſyſtem, till Galen appeared; who, though he adopted the practice of Hippocrates, indulged himſelf in the moſt extravagant theories, in explaining the cauſes of diſeaſe. With him, the proper mixture of the four elements was eſſential to life and health; and diſeaſe enſued when one or the other of theſe preponderated: hence aroſe the refrigerating medicines, calefacients, evacuants, and emollients. The more ſober phyſicians who continued the practice of Hippocrates, which was founded on obſervation alone, were ſtiled *empirics*; while thoſe who adopted the theories of the times were named *methodiſts*. After the downfall of the Roman empire in the fifth century, by the irruptions of the Pagans and Saracens, the remains of Roman and Grecian learning ſheltered itſelf in the walls of Conſtantinople, from whence it made its way among the eaſtern nations; and medicine, particularly, was cultivated by the Arabians: but throughout Europe, the moſt profound ignorance prevailed for nearly a thouſand years. But though the art was cheriſhed by the Arabians, it does not appear to have made any great progreſs, if we except the introduction of chemiſtry, which muſt be regarded as of the utmoſt importance, from which they were enabled to add much to the materia medica, ſomething to therapeutics, but little or nothing to anatomy and ſurgery.

As the liberal arts became again encouraged in Europe in the 15th century, the practice of the Arabians became the guide of phyſicians, till, from a knowledge of the Greek language, it was diſcovered that their learning was gained from Hippocrates and Galen, with the addition of ſome few opinions from chemical facts. From this diſcovery, medicine became ſtudied and practiſed after thoſe great maſters, till early in the 16th century, when the followers of medicine again divided themſelves into two ſects: the *galeniſts*; and thoſe who adopted a chemical mode of reaſoning. Paracelſus ſeems to have been the father of the latter, and by the efficacy of his preſcriptions, gained many followers. His experiments introduced the knowledge of many new and powerful remedies; which, though at firſt uſed with too much boldneſs, in the end, were of great advantage to the art. An animal body was now conſidered as compoſed, in a ſimilar manner with minerals, of ſalt, ſulphur, and mercury: the exceſs of either of which conſtituted diſeaſe. Nor were the hypotheſes of the other ſect leſs wild; compounding the doctrine of the elements, the mechanics of Aſclepiades, with the vagaries of the Arabians.

Anatomy, during this time, was making but ſlow progreſs, for the cuſtom of embalming now being nearly extinct, and the practice of inſpecting the entrails of animals being entirely ſo, together with the prejudices of diſſecting the human body, remaining in full force, the opportunities were ſtill more confined than formerly: nevertheleſs the practitioners of this time had a conſiderable body of information handed down to them by Hippocrates and Galen, who was ſtiled the father of anatomy. The cultivation of painting threw great light on this ſubject; for it frequently happened, that a miſtaken public would permit the diſſection of bodies for this purpoſe, and refuſe them for the nobler intent of teaching the healing art. Leonarda da Vinci is a ſtrong inſtance of this, and likewiſe the figures of Veſalius's anatomy which were deſigned by Titian. There were ſeveral to whom the revival of the ſcience on the reſtoration of learning was aſcribed, as Mundinus a Milaneſe, Jac. Berengarius, and others: but Veſalius, who was chief phyſician to the emperor Charles V. and Philip II. of Spain, deſerves this honour more than any other. Till this time, though it had been always deemed as the moſt important part of phyſic, yet no great advances had been made, principally owing to the prejudices of mankind, which made the diſſecting human bodies ſacrilege. After Veſalius ſucceeded others during the 16th century, who enriched this ſcience, as Sylvius, Fallopius, Fabricius, Bauhinus, Hoffman, and others. From this cultivation of anatomy, the art of ſurgery became much improved, and accordingly we find that, during the 16th century, it had aſſumed a much more ſcientific, and ſyſtematic form. During this period appeared the great Sydenham, when reaſon again reſumed her empire and wild conjecture gave place to a judicious and careful obſervance of the riſe and progreſs of diſeaſes by which a valuable harveſt of facts was reaped, which occaſioned our great author to be ſtiled the Engliſh Hippocrates: yet even he was not free from the ſubtle contagion of theory, by which he deſtroys his accuracy, by the application and cauſes he aſſigns for the appearances he has noticed: this is inſtanced when he ſpeaks of the ebullition, and ſeparation of the inflamed parts of the blood. The matter of ſome diſeaſes being ſo ſubtle as to require no digeſtion, while that of ſome being ſo groſs, requires much, &c. &c. Neverthelеſs the practice of medicine became infinitely improved by the works of this eminent phyſician; and future ages will acknowledge the obligation.

In the 17th century, the healing art in all its branches continued to improve, though new theories aroſe. From the great diſcoveries in philoſophy, by the immortal Bacon; the animal functions became explained on mathematical and mechanical principles,

ciples, which was carried to the moſt uſeleſs exceſs: but to which this great philoſopher was not intentionally acceſſary; for he ever maintained, that the ſureſt baſe for philoſophy, was actual experiment; and hence that medicine was only to be promoted by patient obſervation, by active inveſtigation, and experimental enquiry. The organs were now conſidered as ſo many machines, whoſe powers could be calculated with the utmoſt preciſion: but how fallacious this muſt prove, is evident from the contradictory calculations of Borelli, Haller, Keil, and others. One calculates that the heart overcomes a reſiſtance equal to 180,000 pounds; while the ſecond reduces it to 51 pounds; and the third to a ſingle pound. Dr. Pitcairn ſuppoſes the force of the muſcles to be in a compound ratio of their length, breadth, and depth; whence knowing the force of any one muſcle, we can by the rule of proportion from their weights, determine that of another: this he applies to the ſtomach, and by a computation of its muſcular force, it is proved to be equal to 117,088 lbs. Others, with more probablity, perhaps, have conſidered five ounces as the proportion of its force. Even the operation of medicines, was now accounted for in the ſame way, ſome acting by their gravity, others ſimply by their figure, and others by the ſize of their particles. Pathology, after this, again fell under chemical influence, though the old and long received doctrine of affection of the fluids maintained its ground, and was not a little ſtrengthened by the important diſcovery of the circulation of the blood in this century. But the improvements in therapeutics, were by no means equivalent to thoſe in anatomy and phyſiology, during this period. In 1622, Aſellius diſcovered the lacteals, which were of the greateſt poſſible advantage to phyſiology, and no leſs to therapeutics. In 1628, the immortal Hervey brought forward his grand diſcovery of the circulation of the blood, which envy in vain attempted to rob him of. In the middle of this century, the knowledge of the lymphatic ſyſtem became compleat, by the diſcoveries of Pecquet and Bartholine. Steno, about the ſame time, firſt demonſtrated the ſalivary ducts, and Wirtſungus the pancreatic duct. In fact, the whole body became now more accurately known, and deſcribed, by the reſearches of various eminent anatomiſts; ſome of which confined their diſſection principally to one part; as Willis to the brain, Gliſſon to the liver, Wharton to the Glands, Havers to the bones, Cowper and Douglas to the muſcles: while others carried their reſearches throughout; among which, the moſt eminent were Malpighi and. Ruyſch. But the antient prejudices againſt diſſections of the human body, had not yet ceaſed; which, by fettering their enquiries, induced them in many inſtances to take their deſcription of parts from thoſe of brutes. Veſalius accuſes Galen of this, and yet is evidently falling into the ſame error. Willis appears to have taken his tables of the brain from the dog, calf, and other animals; and the names of aorta aſcendens, and deſcendens, evidently aroſe from the diſſection of horſes, aſſes, oxen, and ſome other animals, in whom theſe veſſels are very definite.

Soon after the commencement of the 18th century, ſeveral other ſyſtems of phyſic prevailed; the principal of which were introduced, by Stahl, Hoffman, and Boerhaave. Stahl was much followed in Germany; he adopted the idea of an agent in the ſyſtem ſimilar to the nature of Hippocrates, and which agent, he maintained, exiſted in the rational ſoul, having an independent power of action, by which it ſtirs up the body, not only to remove diſeaſe, but to reſiſt its attack, by the intelligence it poſſeſſes of its approach. This principle is ſimilar in fact, to the antient *vis conſervatrix et medicatrix naturæ.* The rational part of which doctrine, it has been obſerved, has been improved by Mr. Hunter, and forms the foundation of thoſe great truths laid down by him, and the more complex, abſtruſe, and viſionary, have formed the principal points in the theories of the magnetiſts of the preſent day. Hoffman modified the older opinions, and began thoſe reſearches that led to the formation of the doctrine of ſpaſm, and affection of the nervous ſyſtem. To Hoffman, likewiſe, we are indebted for the firſt hints whereby humoural pathology became finally overturned, and that of the ſolids eſtabliſhed in its room.

Boerhaave was a moſt eminent phyſician, born in Holland. He early formed the moſt compleat ſyſtem that had ever yet appeared, and which retained its celebrity longer than any other that had appeared, and which has yet many admirers. The fundamentals of this ſyſtem were drawn from the humoural pathology, with many amendations and additions, in conſequence of his application of the diſcovery of the circulation of the blood. He likewiſe added the idea of laxity and rigidity, and the ſimple ſolid, occaſioning diſeaſe; and of the ſame likewiſe ariſing from acrimony and lentor of the blood, This opinion of lentor was a conſiderable agent in his conſideration of diſeaſe; he conſidered the body as formed of a congeries of veſſels, containing different fluids, upon the free and undiſturbed circulation of which health depended: but as theſe veſſels were liable to become conſtringed, and the fluids to take on a lentor, by which they were rendered incapable of circulating: this formed the remote cauſe of diſeaſe, and obſtruction was conſidered as the proximate.

At this time, likewiſe, phyſiology was making rapid advances, under that great experimentaliſt, Baron Haller, profeſſor of anatomy in the univerſity of Gottingen. His great doctrine of *irritability* has been perhaps the ſubject of more diſpute than any other opinion that ever prevailed in phyſic; he has been accuſed in conſequence, of leaning towards the ſide of materialiſm; but it is ſaid he diſclaimed any ſuch opinions, and was ſeriouſly hurt at the imputation. *Irritability* is a principle, or a life, peculiar to the fleſhy fibre, independent of the general life of parts, and likewiſe independent of the nervous power. It is ſaid, this principle was known and acknowledged long before, but not accounted for in the ſame manner, nor conſidered as a diſtinct principle. Boerhaave conſidered it as an oſcillatory effect of the nerves. Dr Whytt conſiders it as ariſing from the perception of the ſoul, removing the fibre from the irritation. This irritability of muſcular fibre is brought into action through the medium of ſtimuli, which are various; thus blood is a ſtimulus to the heart, urine to the bladder, and light to the iris. It is independent of the nerves, as he ſhewed it exiſted in animals who were without them, as the polipy; and in monſtrous productions born without brain: add to which, as the heart was firſt formed, it muſt act independent of the nerves. It is well known, likewiſe, that it will act many hours after the influence of the nerves is loſt, as in the heart of a frog and turtle, which contract a long time after death. Plants have much irritability, but no nervous ſyſtem: nor can the ſoul be the cauſe of this principle; for he proves by experiment, that parts the moſt ſenſible are the leaſt irritable, and that irritability continues after death, when the ſoul is ſuppoſed to be fled from the body. A muſcle, therefore, is conſidered by Haller, as poſſeſſing a threefold force; one which it has in common with other animal fibre, whereby it preſerves itſelf from decay; ſecond, the irritability which he has called *vis inſita*; and a third, occaſioned by the influence of the nerves, called *vis nervia*. Theſe do not appear materially to differ from the celebrated powers, elaſticity, irritability, and ſenſibility; but which are much confounded in deſcription: nor does it appear eaſy to ſeparate them. Dr. Wriſberg obſerves, elaſticity was known to Stahl and his followers under the title of tone, but has nothing to do either with ſenſibility or irritability; nor is the vital power of Gaubius, Albinus, and others, to be confounded with this principle of Haller's.

Muſcles act in obedience to the will through the medium of the nerves; and hence when a nerve is cut through, or tied, the muſcle it furniſhed becomes paralytic, incapable of feeling and of motion. Muſcles are therefore capable of contraction, from two diſtinct cauſes; one ariſing from a principle inherent within themſelves, and another received from without, which is the immediate effect of the brain.

Haller, therefore, divided the body into ſenſible, inſenſible, and irritable parts. Senſible parts are ſuch as are capable of producing conſciouſneſs in the mind when they are injured, ſuch are the brain, the nerves of the brain, muſcular fleſh, &c. Inſenſible parts are ſuch as are incapable of this conſciouſneſs when injured; as the bones, and moſt of the parts intended

tended as connecting mediums or coverings; as the pleura, tendons, omentum, fat, ligaments, &c. Irritable parts are ſuch as have ſenſibility, but have irritability as a diſtinct principle ſuperadded; ſuch are parts having muſcular fibre entering into them. This doctrine of irritability has been very ſtrongly combated by different phyſiologiſts. Dr. Munro has endeavoured to ſhew that the vis nervea, and vis inſita, are, in fact, one and the ſame, in his obſervations on the Nervous Syſtem. It has met with no leſs oppoſition from De Haen, Le Cat, Gerhard, &c.; nor does it appear that Cullen was any advocate for this diſtinct principle, when in his clinical lectures, he appears to ſay, that beſides the mechanical tenſion of the muſcular fibres, which they have in common with other animal fibre, they have a contracting force, called *vis contractilis inſita*, which depends principally on a nervous fluid. In other places he calls it *inherent power*. By means of the important facts brought forward by this illuſtrious author, great lights were thrown upon the animal economy, and the ſcience of medicine reaped the greateſt advantages from them.

Dr. Cullen at this time was doing for therapeutics and chemiſtry in this country, what Haller was doing for anatomy and phyſiology in another; and from theſe periods may be dated that ameliorated ſyſtem that has ſince occaſioned the moſt important improvements in the art: Dr. Cullen occupied the chair in the univerſity of Edinburgh for many years, and was confeſſedly the moſt eminent teacher of his time. He began by explaining and correcting the ſyſtem of Boerhaave, which was at that time univerſally prevalent, till he was gradually led to form a ſyſtem in many reſpects totally different from this; and it is to him we are indebted for almoſt the entire overthrow of the humoural pathology, by the eſtabliſhment of this ſyſtem. Nevertheleſs, Cullen retained many of the opinions of Boerhaave, with peculiar modifications. He likewiſe cheriſhed the doctrine of ſpaſm of Hoffman; nor does his forcible explanation of tenſion and laxity differ in eſſentials from the tone of Stahl, or the elaſticity of ſome of his predeceſſors. Dr. Thornton, an ingenious pupil of Dr. Cullen, in his firſt volume of Medical Extracts, deſcribes his ſyſtem nearly in the following manner: the brain he does not conſider as an excretory organ, forming a fluid for the uſe of the nervous ſyſtem, which being alternately exhauſted and recruited, gives occaſion to the alternate ſtates of ſleeping and waking; but that there is a nervous fluid exiſting in it, capable of different ſtates, which he calls its ſtates of *excitement* and *collapſe*. The excitement of the brain, he obſerves, to be in different degrees on different occaſions; it is great in maniacs, reſiſting impreſſion, and with difficulty admitting ſleep: the ordinary degree is, that we enjoy in health, and readily admits ſleep. This excitement may be conſidered as of two kinds, as it reſpects the vigour, or as it reſpects the mobility of the ſyſtem, which different ſtates of the brain are expreſſed by ſtrength or debility in the body. A degree of collapſe takes place in natural ſleep, when the animal functions are ſuſpended; this degree differs, being at times more perfect than at others; hence ſometimes we dream, and ſometimes we do not. A very high degree prevails in ſyncope; when the functions are ſtill more ſuſpended, death enſues. Life, therefore, Dr. Cullen conſiders, as far as it is corporeal, to conſiſt in the excitement of the nervous ſyſtem, and eſpecially of the brain, which unites the different parts, and forms them into a whole. Another favourite theory of this eminent pathologiſt, and which Dr. Thornton has omitted to notice, was, that of ſpaſm of the extreme veſſels being the immediate cauſe of fever. There is a ſimplicity in this doctrine, and a ready appropriation of it to the firſt ſymptoms and appearances of this diſeaſe that made it very generally received; and to this day it has very numerous advocates. He conſiders the primary attack of the cold fit of fever as ariſing from a debilitated ſtate of the powers, which occaſions a ſpaſm of the capillaries. The heart and larger arteries, being fuller of blood from this conſtriction of the ſurface of the body, are rouſed into action to overcome the reſiſtance, which muſt, of neceſſity, be greater than in health, and proportional to the greatneſs of the reſiſtance; this produces the hot fit. The extreme veſſels now give way, and become preternaturally diſtended, which forms the ſweating ſtage, which, if compleat, there is a total ceſſation of the complaint, if not, it recurs. This doctrine, though highly ingenious, is now generally regarded as inſufficient to ſolve all the phenomena of fever; one of the ſtrongeſt objections that appears to me is, that according to the theory laid down, all the ſtages of fever ought to be proportionate, which is by no means the caſe; nevertheleſs, perhaps, fever is not better accounted for by any prevailing opinion. The very ingenious work on this ſubject by Dr. Currie is founded on this principle. Nor were Cullen's improvements in the doctrine of the power, called tone in the ſyſtem, to be overlooked. His ideas on *tenſion* and *laxity* have great force; he conſiders animal fibres as elaſtic, and capable of oſcillation, and to this end tenſion is neceſſary. The whole body is oſcillatory and tremulous, which is evinced from the ear, which is an apparatus to convey the tremor to the nervous ſyſtem: this forms mechanical tenſion, but there is a tenſion peculiar to the fibres of a living animal. In the muſcular ſyſtem this is kept up by the antagoniſt muſcles, by the weight of parts, and by the hollow maſſes they ſurround. The tenſion ariſing from full blood veſſels is neceſſary to the ſtrength and tenſeneſs of muſcles; thus hæmorrhage weakens muſcular force. Many canals of the body depend on this tonic power almoſt entirely, as they have no diſtending power of their own. This takes place in the alimentary canal, which, when wanting this tenſion, occaſions various effects on the conſtitution. The want of this in the ſtomach, produced by hunger, occaſions a weakneſs in the whole muſcular ſyſtem. Diſtention in an inordinate degree is equally hurtful; hence flatulent cholic ariſes from the great diſtention of the ſtomach, and inteſtines, producing irritation from a want of proper counterpoiſe.

By the efforts of theſe great men, the healing art became greatly improved during the firſt half of the 18th century. In anatomy and phyſiology Haller had ſeveral cotemporaries in this and other countries; and it may be ſaid, that the whole of this century will ever be famous for the excellent works it produced, the important improvements it brought forth, and the eminent men it gave birth to. The ſcience was now enriched with many elegant tables, repreſenting various parts of the body, which, as the prejudices of mankind were leſſened, were moſt of them taken from a compariſon of numerous human ſubjects, and hence have the advantages of correctneſs; among theſe may be particularized the beautiful plates of Euſtachius, Albinus, Bidlow, Cheſleden, Haller, Hunter, &c. Our knowledge was further encreaſed by the acquiſitions of Monro on the bones, Winſlow on joints, Innes on muſcles, Winſlow on the viſcera, Hewſon, Monro, and Hunter, on the lymphatic ſyſtem, Hunter and Hamilton on the gravid uterus, Sabbatier, Weittrecht, and Leber on anatomy in general. It is not to the

preſent

preſent purpoſe to follow theſe branches through all their various improvements, nor are the above names placed in any exact order, with regard to their dates, or ſuppoſed merits. It is ſufficient to know theſe improvements took place during the period above alluded to. It was now that the perfect ſubverſion of the humoural pathology took place, which was begun by Hoffman, purſued by Cullen, and finally perfected by Mr. John Hunter. This truly original genius may, with propriety, be conſidered as one of the greateſt phyſiologiſts, anatomiſts, and ſurgeons, this or any country ever boaſted of; and that the art of ſurgery derived more improvement from his aſſiſtance, than from any other individual. As I ſhall have occaſion to mention many of his opinions, and to point out many of his improvements, in the courſe of this work, I ſhall not dwell upon them here, it is ſufficient to ſay, that his perfection of the doctrine of the vitality of the blood, firſt ſtarted by Hervey, is ſufficient alone to immortalize him; and the theory of inflammation he deduced from it, has rendered his name never to be forgotten, while the neceſſity of this art exiſts. Mr. John Hunter was a Scotchman, of low but reputable extraction. Diſguſted with the proſpect of being brought up in the drudgery of a mechanic life, he came up to London to his brother Dr. William Hunter, who was at that time engaged in practice, with great reputation as phyſician, man-midwife, and teacher in anatomy. Here he applied himſelf with ſuch diligence, as to be able to demonſtrate, the following winter, to his brother's pupils. Mr. Hunter went abroad ſome time after this, as an army ſurgeon, and it was from purſuing the duties of his profeſſion in this ſituation, that he made thoſe great improvements in gun-ſhot wounds, he afterwards favoured the world with. On his return he purſued with ardour his inveſtigations in comparative anatomy; but he roſe to fame and extenſive practice but ſlowly. During Mr. Hunter's cultivation of ſcience, he collected ſpecimens of every thing within his reach to illuſtrate the higher branches of natural hiſtory, and the animal economy, till he accumulated the moſt ſtupendous collection, into a muſeum: that was not only an individual, but a national honour, which it was conſidered, as at his death government bought it at 20,000l. For ſome years previous to his lamented death, his utmoſt ambition was gratified by an encreaſing fame, a moſt extenſive practice, and very lucrative employments.

The latter part of the eighteenth century will ever be famous for the immenſe improvements and diſcoveries in chemiſtry, in which arts and manufactures were equally benefited, with medicine; and for the formation of a chemical theory formed in a great meaſure from the diſcoveries in pneumatic chemiſtry. By this ſyſtem all parts of the body have been analyzed, as well ſolids as fluids: their ſeveral relations to each other maintained; the phenomena reſulting from the agency of external objects accounted for, and a chemical pathology, and *ars medendi*, eſtabliſhed. Nor is this period leſs remarkable for the introduction of a ſyſtem, that, for a time, threatened to overturn all former theories, and which, as a compleat body of medicine, is entirely different from all that have ever illumined the horizon of ſcience.

This certainly moſt ingenious ſyſtem was produced by Dr. John Brown, a pupil of Cullen's, and was apparently begot by oppoſition, foſtered and brought up in ſome degree by the ſame, and finally attained its eminence more by the exertion of others, than thoſe of its original framer: and it is more than probable, that it will owe its death to the intemperate zeal of its warmeſt benefactors. This unfortunate, eccentric, but great genius, by not poſſeſſing the neceſſary virtue of prudence, nor the happy arts of conciliation, languiſhed in indigence, and died miſerably; nevertheleſs, his fame will long be ſupported by the numerous adherents to his tenets, by the wide diſſemination of his opinions, and the very numerous proſelytes they have gained in every quarter of the globe. The Brunonian doctrines are dangerous in the extreme in the hands of the inexperienced, nevertheleſs, they contain ſome very grand and forcible truths, and would tend very materially to the advancement of the healing art, if received with caution, and acted upon with prudence, carefully ſeparating truth from error. It is from an abuſe of its principles, that its benefits will be loſt; it has been received with too much avidity, and too implicitly followed, hence its errors have become manifeſt to its friends, and have been magnified by its enemies, and its merits will be finally loſt to both.

This ſyſtem has found two moſt warm and zealous ſupporters in Drs. Beddoes and Thornton; nor has the celebrated author of the Zoonomia withheld his teſtimony of approbation. Dr. Beddoes, with a motive that does him the higheſt honour, tranſlated from the original Latin, Dr. Brown's works; for the benefit of his diſtreſſed family.—— Dr. Thornton has written a voluminous work, profeſſedly upon the Brunonian ſyſtem; in which it appears a little remarkable, that he ſhould ſtile that an illuſtration of the general principles of medicine, intended for the uſe of all claſſes of readers, particularly for the curious not of the medical profeſſion, under the title of the Philoſophy of Medicine; which in fact, is only a comment on the opinions of an individual, novel in themſelves, and conſequently not eſtabliſhed; with an advertiſement of ſome diſcoveries in a particular branch of chemiſtry. Nevertheleſs, though the title appears not be ſtrictly appropriate, yet the work itſelf is elegant and ingenious.

" Dr. Brown ſuppoſes man when living ſurround-
" ed by *external agents*, which acted upon him

" while

" while *alive*, but their effects ceaſed when dead.
" Theſe he called *ſtimuli*, and the *living principle*
" brought into action by theſe, *excitability*; and the
" word *excitement*, was uſed to expreſs the *action*
" produced by ſtimuli. Every thing in nature that had
" any action on the frame, he conceived to be *ſtimu-*
" *lant*; and upon this principle *life* appeared to him
" a *forced ſtate*, dependant upon *ſtimuli*; and every
" diſeaſe might be referred to *theſe powers*, and the
" *condition* of the *excitability*, which *varied conſider-*
" *ably*, never becoming *perfectly ſtationary*." Such are the general principles of the Brunonian doctrine, as given by his warm and ingenious advocate Dr. Thornton. This theory, as applied to the treatment of diſeaſes, of courſe introduced a practice as novel as the ideas from whence this practice aroſe; though Mr. Saumarez in his treatiſe on phyſiology, endeavours to ſhew that this ſyſtem is formed from the ideas propagated by Mr. Hunter, and he draws the analogy between the two ſyſtems, as far as they will hold, though under varied terms. John Brown, he ſays, is juſt thus far, but when he quits his mentor he is loſt, and his principles rendered pernicious, and his practice dangerous. Hence in the Brunonian ſyſtem, " there are only two idiopathic diſeaſes, and
" that even theſe are not produced by powers dif-
" ferent in kind, but only in degree," and " that
" all the ſtates of whatever can be called life in the
" univerſe were owing to this difference in degree.
" To this, with reſpect to diſeaſe, nothing can be
" added,

"added, but that ſometimes a derangement of the "ſolids, as ſimple and inanimate; or a fault of organization may occur. This may ſometimes affect the general ſyſtem: but whenever it does it "muſt be conſidered as ſlightly different from "idiopathic affection, in its cauſes and mode of "cure, theſe being local while thoſe of diſeaſe are "general."

It is the misfortune with all framers of ſyſtems, that by blind partiality, they overlook the merits of ſurrounding objects, though perhaps of equal utility; and regardleſs of theſe, ſum up all human perfection in the theory they have formed: this is exemplified in this inſtance; for the Brunonian doctrine almoſt entirely overlooks the noble art of ſurgery; anatomy, the baſis of the healing art is equally neglected: and the neceſſity of a long courſe of ſtudy and experience, which has hitherto been ſo much inſiſted upon, to the attainment of a knowledge of local diſeaſes, is at once done away. It is ſelf-evident this is a moſt dangerous doctrine, which even his moſt ſtrenuous advocates have not attempted to defend. Dr. Thornton owns this, and illuſtrates its evil tendency by the following appoſite imaginary anecdote: "A child was in ſeeming "agony, and ſhewed evident marks of great excitement; the Brunonian bled, bliſtered, and "purged, to reduce the ſyſtem. It was found a pin "had run under the ſcapula: ſurely the firſt indi-

" cation was to take out the pin; afterwards to cor-
" rect the diatheſis."

With Dr. Brown, life is a forced, not an original ſtate; the effect of the application of what he terms exciting powers: theſe exciting powers acting on the excitability, or matter of life, draw forth the excitement or life itſelf.

Exciting powers, *i. e. ſtimuli*, are of two general kinds; ſuch as ariſe from within; and ſuch as are external, and ariſe from without: of the firſt kind are muſcular motion, the actions of the mind, and the various function of the body; the ſecond kind or external, are heat, food, wine, fluids of the body, air, poiſons, contagions, &c. A determinate portion only of this excitability, on which the phenomena of life depend, is given to every animated being, but that it varies in different animals, and in the ſame animal at different times.

This excitability of which Dr. Brown allows himſelf to be ignorant farther than regards its exiſtence and effects; he ſuppoſes is generated by the brain, and reſident in the medullary portion of the nerves, and in the muſcular fibre. A late ingenious author ſays, " It were to be wiſhed that Dr. Brown
" had found out a ſeat for the excitability of vege-
" tables alſo; of thoſe active and highly vital
" ſyſtems, that are totally deſtitute of medullary
" nervous matter, or muſcular ſolid!" This determinate portion of excitability, is an inexplicable part of

of this doctrine, and is an evident contradiction to itſelf, and is conſidered as ſuch by Dr. Beddoes; but he, with the other ſupporters of this theory, conſiders that this excitability is continually reproduced *(See Introduction to Brown's Elements, by Dr Beddoes)*; and in ſome parts of his works, Dr. Brown conſiders it as reproduced himſelf.

As life is but a forced ſtate, there muſt be a conſtant tendency to diſſolution; which tendency is reſiſted by the application of the exciting powers or ſtimuli: yet as theſe powers at the ſame time that they ſupport life, by the excitement they produce, waſte the excitability or matter of life, it follows that every animated being at length yields to the common lot of death; as an unavoidable reſult of the powers themſelves. It appears, that if we even allow the reproduction of excitability, which Dr. Beddoes has ſaid will remove moſt of the difficulties in this theory, we muſt yet look for the common cauſe of death, in ſomething more than this waſte of excitability.

The exciting powers producing life, may be applied in ſuch a degree as to occaſion *debility*, becauſe the excitability becomes defective: hence immoderate exceſs in drinking produces its effect. This ſpecies of debility he calls *indirect*. But when the exciting powers are withheld, the debility reſulting from this is named *direct*. An ingenious advocate for this doctrine, Mr. Herman, endeavours to ſhew that this diſtinction of debility into direct and indirect is falſe. He allows the firſt effects in theſe caſes are different, but the ultimate reſult the ſame, producing a debilitated organization. Upon this diviſion of debility, nearly the whole application of this ſyſtem to practice reſts; and from this he was led to form his bold poſition, "that there were "only two idiopathic diſeaſes, *ſthenic*, and *aſthe-* "*nic*." Sthenic diſeaſes are allied to, and occaſioned by, indirect debility, being brought on by the exceſs of powers that otherwiſe produce health. Aſthenic diſeaſes, on the contrary, are thoſe that ariſe from direct debility, occaſioned by the abſence of ſome of the neceſſary ſtimuli: yet both the ſthenic and aſthenic form of diſeaſes are not produced by powers different in kind, but only in degree.

As there are but theſe two general forms of diſeaſe, ſo he deſcribes but two general forms of practice: in the one, a refrigerating and antiphlogiſtic plan, is to be purſued: in the other ſtimulants, are the only proper remedies.

Therefore, inſtead of all the former care and attention uſed to aſcertain the nature, cauſe, duration, and probable termination of a complaint; nothing more is neceſſary but to decide to which of the two claſſes the diſeaſe belongs, and proceed to the treatment. All noſological arrangement would thus be at an end, and diſeaſes of ſtrength and weakneſs, would claſs the whole. There is an apparent ſimplicity in this ſyſtem that tends to miſlead the unwary and inexperienced; and more particularly it becomes eagerly caught at by the idle, and forms a ſhelter for the ignorant and aſſuming: but whatever may be its excellencies, and however grand its truths, it muſt be allowed to be a moſt dangerous theory to the juvenile mind: and I would anxiouſly caution the medical ſtudent, firſt to make himſelf converſant with all the general and received opinions and modes of practice, before he enters upon any examination of this ſyſtem; by which means, he will then be enabled to derive the advantages it holds forth, without plunging into its errors; he will then not be faſcinated with the apparent eaſe of attaining what ages have not yet perfected; and thence led to relax his attention and reſearch, upon which alone he is to hope for eminence. ——It has been objected to this theory that it recommended intemperance; but it has ever appeared to me much more likely to promote idleneſs among the practitioners in the different branches of the healing art. Nevertheleſs when the pruning hand of time ſhall have diveſted it of its errors, unleſs intemperate zeal ſhall cruſh it quite, we ſhall probably gain ſome valuable hints from it, and the practice of phyſic may feel its beneficial influence.

I have thus brought the hiſtory of medicine down to a late period in a conciſe manner. With regard to the eminent men of the preſent day now living, it is not here to our purpoſe to ſpeak of them. It is ſufficient to ſay that every branch of the art is at this time cultivated in Great Britain, with unprecedented ardour. We no longer borrow our ideas in ſurgery from the French; we even dictate to them, and the whole world, improvements in this noble art: and the pathology of the ſolids perfected and long eſtabliſhed in this country, is received from us and practiſed upon, and gaining ground daily throughout the world. Cullen is at this time the great French oracle, and Mr. Hunter's tenets are not only the preſent ground of practice, but give law to far diſtant countries. Chemiſtry, which was not till lately a ſubject of Engliſh pride, can now boaſt the moſt important improvements; nor would the new comprehenſive, grand, and luminous theory have been compleat, without the diſcoveries of a Prieſtly, Black, Cavendiſh, and many others. An ingenious author has lately ſummoned up the prevailing opinions, under the materialiſts, the Oxygenous and the Brunonian ſyſtems: and I preſume by the one he deſcribed, he meant to add the rational ſyſtem. Of the firſt, no account is neceſſary; a fortuitous concourſe of matter will never explain nature's great laws, nor ſtrictly as materaliſts are, there are many of this claſs exiſting.

The ſecond are by far the moſt numerous; a chemical theory is now made to explain all the laws of animal oeconomy, as well as to account for all the phenomena of diſeaſe: and it was lately hoped, that by the diſcoveries made in pneumatic chemiſtry, medicine would have received a grand aid, and that a very terrible claſs of diſeaſes would have been deprived of ſome of their terrors: but though ſome ſolid advantages yet may be reaped; hitherto the benefits have not been permanent.

Of the Brunonian doctrines, I have endeavoured to give ſome account; and it remains only to ſay, that the rational ſyſtem is that I would earneſtly recommend to the veterinary ſtudent; which is formed not by a blind acceptance of any theory, however luminous; but by a patient and diligent inveſtigation, a ſubmiſſion of all opinions to the teſt of experiment, and a culling of truths from every ſource, together with a careful obſervance of facts, and a guarded ſuſpenſion of judgment: it is by theſe only that the practitioner can become eminent, and the patient relieved.

SECTION II.

Hiſtory of Veterinary Medicine.

MAN, ever ready to improve ſurrounding objects to his advantage, would not be long without ſubjecting to his uſe ſuch animals as his reaſon led him to ſuppoſe would prove moſt uſeful, or his experience had proved were the moſt tractable. Animals, when domeſticated and removed from a ſtate of nature, would not long continue with unremitting health, and hence their owners would be led to ſearch for ſuch remedies as their ſmall ſtock of information pointed out: thus veterinary medicine muſt, in ſome degree, have been coeval with the knowledge and domeſtication of the animals in queſtion. It is probable that branch of it called farriery, was of later date: inaſmuch as the ſubjugation of the horſe himſelf was ſubſequent to that of other domeſtic animals. At what exact period this took place, is not neceſſary to enquire; but it is evident as human medicine was originally confined among the prieſts, ſo veterinary medicine was only practiſed by peaſants and ſhepherds. Yet that it is of very antient date, cultivated even as a regular art, we have ſufficient teſtimonies: theſe reach to long before the chriſtian æra. Indeed reaſon would convince us, that as man beheld his own diſeaſes removed or leſſened, by the application of certain means, he would be led to employ ſimilar means in the complaints of the valuable animals under his care: and whenever we hear a people celebrated for their care and attention to their animals, it is but juſt to infer this art muſt have been cultivated among them. Homer, who flouriſhed 907 years before Chriſt, celebrates the care and management of the Greeks, with regard to their horſes, and the pains that were beſtowed to train them for their courſes; hence, there is no doubt, that at this period the care of animals under diſeaſe, fell to the charge of a particular ſet of perſons. Xenophon, a Greek philoſopher and poet, wrote a treatiſe on equitation, nearly 400 years before the birth of Chriſt; in which he quotes ſeveral authors who had treated on the ſame ſubject long before, hence we may naturally conclude the treatment of the diſeaſes of the horſe had aſſumed a regular form long before this. The term, *veterinary*, appears a very antient one, as may be learned from the relics of literature, ſaved from the devaſtations of the barbarous ages; in which are frequently met with, the terms *veterinarius*, and *veterinarius medicus*. It appears derived from the Latin appropriate to beaſts of burden, *veterina ad vecturam idonea*. The antient etymologiſts have it *venterina*, becauſe it is to the venter or belly that the faſtenings were made, by which the antient packs were kept on the pack-horſes' backs: hence veterinary medicine ſignifies properly the treatment of the diſeaſes of animals uſed for burden: but has been underſtood as applying to the diſeaſes of animals in general; and with us is more immediately applied to the treatment of horſes; though ſtrictly ſpeaking farriery is only a branch of veterinary medicine, though the moſt important. The French uſe the term *vétérinaire* for the ſcience of animal medicine in general, and Hippiatre, for that which treats of horſes. "*Hippiatre, medicin du cheval; d'ippos, cheval, iatros, medicin.*" Dict. d'Hippiatrique.

But it appears, that however it might be profeſſed by individuals, and hence gain an appearance of regularity, it was not till the time of Hippocrates, that it made any advance of conſequence; but by the benefits that reſulted to the healing art in general from this great luminary, this ſubject likewiſe became inveſtigated more narrowly. Men at this period led a more ſimple life, and were moſt of them graziers or ſhepherds; ſome of them had immenſe droves and flocks, to whom the art was neceſſarily very acceptable, from the frequency with which they muſt need its aſſiſtance: there was ſtill a farther reaſon why the art ſhould now improve. By the inveſtigations of Democritus and Hippocrates, the attention was turned in ſome degree towards anatomy, or the internal formation of the body; which as theſe reſearches were only carried on upon brutes, to which they were led by the practice of examining the entrails as an omen, they muſt in the end not only become acquainted with the frame in a healthy ſtate, but have many opportunities of ſtudying morbid anatomy; which inſenſibly led to attempts at counteracting the diſeaſes: hence the veterinàry art muſt neceſſarily have made ſome conſiderable progreſs. That it did ſo is very evident; for we are informed it was at this time deemed ſo important that the great Hippocrates himſelf wrote a treatiſe on the ſubject. It farther appears from antient teſtimony, that it was uſual for the moſt celebrated phyſicians to make this art a part of their ſtudy; and that many of them practiſed indiſcrimiately upon man or beaſt.

" On peut auſſi remarquer que ces deux medi-
" cines des hommes & des brutes, étoient autre-
" fois exercées par une même perſonne; Abſyrtus
" nomme ſouvent un médecin de chevaux, &
" quelquefois ſimplement un médecin. Anſi, au
" commencement du 1 livre, il y a pour inſcription,
" Abſyrtus à Hippocrates, médecin de chevaux,
" ſalut; & au chap. 22, Abſyrtus à ſecundus, Mé-
" decin de chevaux ſalut: au chap. 42. Abſyrtus à
" Statilius Stephanus, medecin ſalut; & au chap. 69,
" Abſyrtus à Hegeſugoras, tres-bon médicin, ſalut.
" Tous ces hommes là, pratiquant la médecin ſur
" les chevaux, conſultoient Abſyrtus touchant
" leurs maladies les plus importantes." Dict. d'Hippiatrique, tom. ii. p. 411.

It will readily appear from this, that the veterinary art was deemed at this early time, highly important, and likewiſe highly honourable: and that it was as regularly practiſed as human medicine, not only by phyſicians in general, but probably by perſons ſet apart for the purpoſe. We have not, however, any written remains on this ſubject, I believe, till after the chriſtian æra; from the beginning of which we have ſeveral fragments. Valerius Maximus mentions one Herophilus, a farrier, *equarius medicus*, who had written; but his works have not been preſerved. It was 50 years only after the birth of Chriſt, when Columella wrote his celebrated treatiſe, in which he mentions an eminent cotemporary of his, Pelagonius, who had likewiſe written; but of whoſe works I believe we have no remains. From this time, till about the third century, we have nothing tranſmitted down to us, but the names of ſome of thoſe who either practiſed or taught this art. Nevertheleſs, theſe teſtimonies are ſufficient to ſhew, that from the earlieſt ages veterinary medicine was in the higheſt eſtimation: if we wanted further proofs of this, we might add, that as in antient times, the importance, value, and eſtimation of any ſubject was depicted by fable, ſo this branch of the healing art, was ſaid to be derived from the Gods. Hierocles, a very old Greek author, aſcribes its origin to Neptune. Chiron, who is ſaid to have been the preceptor of Eſculapius,

pius, is repreſented as a centaur, or half man, and half horſe; ſignifying that his care extended equally over man and beaſt: it may be added that remarks on the diſeaſes of animals were permitted to be written on the walls of the temples, ſides of the columns, &c. with other branches of uſeful learning.

It was about 300 years after the birth of Chriſt, when the true father of this art appeared; the veterinary Hippocrates, *Vegetius*, who wrote his *Vegetii, Artis Veterinariæ*, which was the oracle of many ſucceeding ages, and upon which many of the future improvements were built; how great his attention to the ſubject muſt have been, and how accurate his obſervations, may be gained from the following account which he gives of fever: "A "horſe attacked with a fever, hangs his head, ex-"tend his eyes, with his lips relaxed, and pendant: "he has a dull heavy air, his body moves with dif-"ficulty, and his teſticles are looſe, and pendu-"lous. In theſe caſes the legs are uſually hot, his "arteries beat ſtrongly, and his breathing is very "quick, with hot breath, and frequent cough: he "ſtaggers in his pace, loaths his food, but has great "thirſt and ſleeps not at all." The cauſe of fever he attributes to exceſſive fatigue, to the crudity of his food, or to perſpiration ſuddenly checked.

The cure he recommends is bleeding, abſtinence, and pure air, with ſlight and gentle exerciſe. Whoever will be at the trouble of comparing this, with

many

many ſubſequent authors, will find that much had not been gained ſince his time, but on the contrary, that the ſcience degenerated into ignorance and barbarity in future days. Vegetius complains of the little cultivation of the art in his time, in proportion to its merits and importance, which he ſays has always been held ſecond in eſtimation to human medicine. He likewiſe gives an account of all the moſt celebrated authors, and practitioners, among whom the moſt worthy of notice, are Columella, Abſyrtus, Chiron, and Pelagonius. The art appears to have gained little in addition, for ſeveral centuries ſubſequent to this; though ſome writings on the ſubject appeared; of which we have only extracts handed down to us, and for which we are indebted to one of the Conſtantines. Conſtantine Porphyrogenet, who commanded that all the writings on this important ſubject that had appeared, ſhould be collated, and the ſubſtance of them formed into one work, for the future guidance of practitioners, and the preſervation of the antient opinions. A copy of this compilation by ſome means eſcaped the general devaſtation that took place, as well as a copy of Vegetius; and it is to theſe we are indebted principally for our knowledge of the ſtate of this art in antient times.

The irruptions of the barbarous nations, which deſtroyed the Greek and Roman learning, muſt have neceſſarily, likewiſe, influenced this; nor do we find that though the Arabians were celebrated for their attachment to their horſes; and though they cheriſhed and encouraged human medicine, yet we have few accounts of any attention and encouragement paid to veterinary medicine; hence on the reſtoration of learning in the 15th century, few remains of this valuable art were left; and as the progreſs of ſcience was ſlow, and as but few horſes were kept at this period, and iron ſhoes being now generally worn, ſo what little attention was paid to the diſeaſes of horſes devolved on the forgers of their ſhoes, and that which regarded other animals was practiſed by the goatherds, ſhepherds, and perſons attending cows and oxen. But in the 16th century, when Europe became more enlightened, and the liberal arts encouraged, the neceſſity of a cultivation of this uſeful branch became evident. Francis the Firſt, who has generally been termed the reſtorer of learning, ordered the collection of Conſtantine's to be tranſlated from the original Greek into Latin by Ruelli, a phyſician; from which it was ſoon afterwards rendered into Italian, German, and French; and by this means became diſperſed over Europe. Nearly at the ſame time, likewiſe, the works of Vegetius became tranſlated into ſeveral languages. From this period we may date the improvement of the art, and during this century many treatiſes upon it appeared in different parts of Europe: among thoſe to whom the ſcience was indebted, may be reckoned the celebrated hiſtorian Geſner, who compiled from Ariſtotle, Pliny, Ælian, Oppian, Varron, Columella, Vegetius, and others, an extenſive hiſtory of animals. The part treating on domeſtic animals was enriched with ſome valuable remarks on their diſeaſes. Vincent, an Italian author, publiſhed receipts for the cure of all the maladies of horſes in the firſt half of this century, and ſoon after the celebrated works of Laurentius Ruffius appeared in Latin. In the latter half of this century appeared the natural hiſtory of ruminant animals, with the phenomena of rumination, by Æmiliano, publiſhed in Venice. *Libro de marchi de cavalli Venice* 1588. *Hippol Bonacoſſa, tractatus, equorum Venice*, 1590. *L'Hippoſteologie par J. Hernard, Paris*, 1599. It was, I believe, in this century, that the celebrated and learned Leonarda da Vinci, a moſt eminent Italian painter, publiſhed his anatomy both of the human body and of the horſe; which works are extremely ſcarce. There is a copy of the latter, I believe, in the Queen's library. This illuſtrious author is not uſually mentioned in hiſtories of medicine; and I have underſtood Dr. Hunter was the only lecturer who introduced his name on theſe occaſions, though at the time his works appeared, they far ſurpaſſed all his cotemporaries. Monſieur Vitet, to whom I am indebted for many names of authors, mentions nothing of him.

During the 17th century the art gradually advanced, and numerous were the publications on the ſubject that appeared in every country. I ſhall only notice ſuch as appear to have more materially benefited it. The names I am acquainted with are Cæſar Fiarchi, Paſqual Caracciolo, Clementi Corti, Ruini, Dumeſnil, Beaugrand, Delcampi, Epinay, Liberati, Debaurepert, Hobokeni, Peyeri, Blaſius, Solleyſel, and others. Fiarchi wrote an Italian treatiſe on horſemanſhip, in which he introduces a very rational method of ſhoeing, forbidding the uſe of calkings, as deſtructive to the feet; and, where neceſſary, recommends one only on the outſide heel, and that ſmall. The *infermita, & ſuos remedii, del Signor Carlo Ruini* was publiſhed in Venice, 1618. It is from this celebrated and elegant work that Snape, Gibſon, and almoſt all the French authors, have copied their plates. I have never ſeen but one copy of it, but I was ſurpriſed at the elegance of the plates, and for the time they were publiſhed in, their comparative accuracy. In 1654 the *Grand Maréſchal Francois* appeared, a very large and meritorious work, ſaid to be compoſed by ſeveral hands. In 1675, Gerard Blazius, a Dutchman, publiſhed in Amſterdam a treatiſe of the anatomy of the horſe, with ſome plates, which were highly ſpoken of. In the latter end of this century, 1698, the art received a very great addition from the elaborate work of Sollyſel, which muſt ever be conſidered as even a national honour. Nor can we ever ceaſe regretting that this excellent author had not received a general medical education. Sollyſel's attention was drawn to this ſubject from his ſituation as manage, or riding maſter, in whoſe hands the treatment of the diſeaſes was very generally confined; and hence it is obſerved, that almoſt all the treatiſes on this ſubject, in this century, are combined with the arts of the manage, and the modes of riding; and it is to this that we muſt principally attribute the ſlow improvement in the art. For the riding maſters being uſually men of ſome ſcience, and, in moſt inſtances, profeſſing a knowledge of the diſeaſes of horſes, from their habits leading them to be ſo much about the perſons of the animals, it was thought leſs neceſſary for medical men to attend to the art; and it was not likely to reap any ſolid advantages from men of this ſtamp, for they muſt of courſe be deſtitute of the proper means of forming a well grounded practice upon a knowledge of the animal economy, and an acquaintance with the anatomy of the animal. I have, therefore, ever regarded the treatment of the diſeaſes of the horſe by the riding maſters, and the writers on the manage, combining their deſcriptions with that of the derangements to which the horſe is liable, as the moſt ſerious hindrance to the ſcience; for though at the moment their practice would unqueſtionably be more judicious than that of either a groom or blackſmith, who were uſually the next perſons in command on theſe occaſions, yet as preventing the neceſſity of a more ſcientific plan being ſo evident, the material and future improvements were more retarded than it would, had its errors been more conſpicuous, by the more ſtriking barbarity of grooms and blackſmiths. Nevertheleſs, though Solleyſel profeſſes himſelf ignorant of the anatomy of the animal, yet he has collected ſuch a fund of information as could not fail, at that time, of having a very material effect on the art; nor could its merits long be hid, for we find that it was ſoon tranſlated into every language of Europe, and became the vademecum of every practitioner of that time.

Sollyſel appears to have had a moſt intimate acquaintance with the exterior knowledge of the horſe, and his remarks on the ſubject are ſo judicious, that they are by the beſt judges quoted to this day, nor was his deſcription and account of the blemiſhes and defects of the horſe, leſs admirable. As a man of ingenuity, and conſiderable depth of reaſoning, it was not to be wondered at that he ſhould expoſe and detect many of the errors in practice in his time. We find him, therefore, the firſt who objected to burning for the lampas, as dangerous and abſurd. He firſt reprobated the bleeding in the palate in fever as uſeleſs, and pregnant with miſchief, from the liability of wounding the palatine artery. He taught the impropriety of introducing feathers with ſtimulating ſubſtances into the noſe, as the inflammation occaſioned might produce ulceration and the glanders. He likewiſe pointed out the danger and folly of tying down the teſticles, when they were drawn towards the abdomen by pain and irritation, but directs that means ſhould be uſed for leſſening the irritation.

The 18th century will ever make a diſtinguiſhed figure in the annals of hiſtory, for the great advances that took place in the liberal arts in general; among which none experienced a greater alteration than Farriery. As commerce drew wealth into countries, and luxury followed riches, ſo the number of horſes increaſed, and their value augmented: but perhaps what contributed more to the attention of the veterinary art than any other circumſtance, was the dreadful ravages committed in the firſt half of this century, by the malignant epidemic, or murrain, which viſited moſt parts of Europe at different times. The effects of this ſpecies of plague were ſo dreadful, that the prevention became the ſubject of inveſtigation of almoſt every enlightened phyſician; and though no great advances were made in the diſeaſe itſelf, the ſcience in general was benefited by the awakened attention to this ſubject. Numerous were the publications that this dreadful viſitation occaſioned. The moſt celebrated appear to have been thoſe publiſhed by the faculty of Paris in 1714. That publiſhed by Monſieur Hermant, phyſician to the king; and that of the ſociety of phyſicians in Geneva. On this occaſion, likewiſe, appeared a treatiſe of the learned Sauvages; nor muſt we omit a female performance on this ſubject by Madame Foquet. The writers of this century were numerous—I ſhall notice only the moſt eminent. In 1734, Mr. Garſault tranſlated Snape into French. In the ſame year, I. and G. Saunier, two Dutch practitioners, publiſhed their celebrated work. In 1742, the Amphitheatrum Zooticum of Valenti appeared. In 1749, Linnæus publiſhed his Pan Suecus, which is rather an account of habits and manners of domeſtic animals, than any treatiſe on their diſeaſes. It was about the middle of this century that ſeveral of the continental countries opened their eyes more fully on the importance of this branch of ſcience; and the governments of theſe reſpective countries eſtabliſhed ſeminaries for the purpoſe of teaching it ſcientifically. One of the firſt, as well as the moſt celebrated of theſe, was eſtabliſhed at Lyons, over which the celebrated Monſieur Bourgelat was placed as profeſſor. He was director and inſpector general to the veterinary ſchools; commiſſary general to the king's ſtables; honorary member of the royal academy of ſciences, and member of the royal academy of ſciences and belles lettres of Pruſſia. Monſieur Bourgelat was a voluminous author. In 1750 he publiſhed his Elements of Farriery, in 3 vols. In 1765 his Materia Medica, for the uſe of the veterinary pupils. Soon after his Elementary Treatiſe on the Anatomy of the Horſe appeared, which is the moſt complete work of the kind that has ever yet appeared. In 1766 he publiſhed his Elementary Botanical Demonſtrations, for the uſe of the pupils of the veterinary college. He likewiſe gave to the world a treatiſe on bandages applicable to the horſe. By the eſtabliſhment of theſe ſeminaries, the art bid fair to be highly improved. About this time, likewiſe, the King of Sweden granted ſome honourable privileges to thoſe who profeſſed this branch of ſcience, which drew ſome of the beſt practitioners from France and other countries. In 1752 the celebrated work on natural hiſtory appeared, compoſed by Meſſrs. Buffon and Dunbenton, 31 volumes. This ſtupendous work contained many hints on the conformation of animals, and on their economy and diſeaſes, therefore may be ranked as an acquiſition to the art. About this time, likewiſe, appeared the well known work of Guereniere, but which had no merit as a veterinary treatiſe.

As a cotemporary with Bourgelat, lived the elder La Foſſe, a name that will ever be reſpected in the annals of veterinary medicine. La Foſſe made numerous improvements and diſcoveries, which he uſually communicated in the form of memoirs, to the royal academy of ſciences in Paris. In 1754, he collected theſe into one volume, which was quickly tranſlated into other languages, which is a ſufficient proof of its merit. The firſt of theſe memoirs deſcribes the foot and its diſeaſes. The ſecond is the celebrated communication on the glanders, wherein he ſhews this to be a local inflammation of the pituitary membrane, and recommends the uſe of the trepan; but which, it has been ſaid, was not a new mode of treatment, having been practiſed in England before. The third of theſe memoirs deſcribed the uſe of the lycoperdon, or puff ball, in hæmorrhages. The fourth contained his juſtly celebrated improvements in ſhoeing; and the fifth expoſed the error of attributing an epidemic then prevalent, to the bite of the ſhrew mouſe, which was the generally received cauſe. Moſt of theſe were tranſlated into Engliſh by Bartlet, and from them it may be judged how much the art was indebted to him. In 1755 appeared Garſault's *Parfait Maréchal*, which Buffon frequently quotes; but it appears not to merit any diſtinction in this place. In 1756 there was publiſhed in Paris a tranſlation from the Swediſh, of an eſſay on the raiſing and perfecting cattle, which was very highly ſpoken of, but which I have never met with. It was at this time, likewiſe, that the firſt grand dictionary of arts and ſciences came out; in which M. Bourgelat and Genſon were engaged. It appears that the veterinary articles furniſhed by theſe gentlemen occaſioned ſome controverſy; for we afterwards find ſome remarks on them, publiſhed by M. Rondon, farrier to the great ſtables of the king. In 1763, the *Maiſon Ruſtique* made its appearance in Paris. This publication has been quoted in almoſt every language, and introduced into almoſt every work that has been written ſince its time; and appears to have had very conſiderable merit; but the author was not generally known. About this period, likewiſe, ſome treatiſes on different parts of the art were written by Brecand, Boutrolle, Le Clerc, Barbaret, a phyſician; and Bartlet's works were tranſlated into French at the ſame time.

In 1766, La Foſſe, junior, ſon to the above, occupied the ſame ſituation his father had held; that of farrier to the leſſer ſtables of the king, preſented his *Guide du Marêchal*; a work well known in this country, though it has never been tranſlated into Engliſh. The anatomical part is conciſe, and accompanied with ſome good plates. The medical part is, likewiſe, ſuch as to give the whole the appearance of a text book, which it was ſaid to be, to his *Cours D'Hippiatrique*. This work was a very ſuperb one in folio, with 65 coloured plates, publiſhed in 1772. There are, I believe, but three copies of it in England, one of which belongs to the medical ſociety of Woolwich; another is in the hands of a Mr. Mathias, a ci-devant pupil of the Veterinary College, and I believe Mr. Morecroft has a third. But his *chef d'œuvre* is a work very little known in England—the *Dictionaire D'Hippiatrique*, originally publiſhed in four volumes. It may juſtly be eſteemed the beſt practical ſyſtem of farriery that had ever appeared. In 1776 appeared a very extenſive work by M. Vitet, who ſtiles himſelf doctor and profeſſor in medicine: had the execution of this work been equal to the plan on which it was intended to be formed, it would have been an axcellent one; but with a very elegant ſyſtematic arrangement, which he borrowed from a foreign author, and a moſt extenſive collection of ſubject, it is but an indiſcriminate compilation of good and bad; its principal merit conſiſts in an analyſis of authors, to which I am indebted for an acquaintance with the names of many of thoſe who have written on this ſubject.

After the death of Bourgelat and La Foſſe, we hear of no character of any great eminence for ſome years; but it appears, that ſince the revolution, the ſubject has again been more diligently ſtudied, and the names of Hartman, Chabert, and Huzard, ſtand forward. Soon after, or about the time above alluded to, there appeared a conſiderable work, called, *The Rational Dictionary of Medicine, Surgery, and Farriery*, in 6 volumes; and very ſoon after a *Veterinary Dictionary*, by Buchoz, but it has no merit ſuperior to that of La Foſſe. In 1787 Monſieur Chabert publiſhed a *Treatiſe on the Mange* of horſes; ſince which he has likewiſe publiſhed upon the *peripneumonia* of black cattle. There has alſo appeared an eſſay on *the greaſe* of horſes, which gained the prize medal of the ſociety for the promoting the health of animals; to which is joined a report on *thick wind*, and on *broken wind*; but I am not aware who is the author. In 1788 there came out a *Treatiſe on the Haras*, with the method of ſhoeing, cutting, and all the leſſer operations, tranſlated from the Spaniſh of Hartman, by Huzard. Likewiſe, *Inſtructions and Obſervations on Domeſtic Animals*, with remarks on the breeding, rearing, buying and ſelling; with an analyſis of previous authors, by Chabert, Flandrin, and Huzard.

The above authors have alſo publiſhed, conjointly, a *Veterinary Almanack;* containing the hiſtory and progreſs of animal medicine, ſince the eſtabliſhment of the veterinary ſchools. In 1791, Monſieur Lompaigieu Lapole, veterinary ſurgeon, publiſhed *Obſervations on the Health of the Animals of St. Domingo*, dedicated to the Veterinary College at Alfort. In 1797, Monſieur Chabert and Monſieur Huzard publiſhed, by order of government, a *Treatiſe on aſcertaining the Exiſtence of the Glanders, the Means of preventing it, and deſtroying the Infection.* There has lately been publiſhed in Spain a very voluminous work on veterinary medicine, in nine volumes, but of which I know no particulars.

I have thus brought the *Hiſtory of this Art* on the continent, in a conciſe manner, down to the preſent period, from which may be learned what improvements have originated with them, and at what periods. It would appear, that when the ſcience began to command attention, from the exertions of Francis the firſt, and Vegetius became ſtudied, had it progreſſively improved in the degree it might be ſuppoſed to be placed by a converſance with this author, it would ere this have been more approximating perfection; but inſtead of proceeding on the rational ſyſtem of Vegetius, it dwindled again into ignorance or barbarity; and the recipes of manege maſters, and the operations of blackſmiths, were the only oſtenſible marks of its aſſiſtance. From this ſtate the practitioners became in ſome degree rouſed, by the improved ſyſtem of Solleyſel, but he could only combat preſent errors, he could not point the way to future improvement, for he was ignorant of the groundwork whereon to build it, *i. e.* the anatomy of the animal. This defect was only in a ſmall degree ſupplied by the labours of Ruini, and in ſome meaſure farther aſſiſted by the demonſtrations of Bourgelat. Many of the remaining errors were combated by La Foſſe with great advantage; and his experiments and diſcoveries on glanders, the rationality and improvements of his mode of ſhoeing, entitle him to great merit. Yet though by theſe exertions, and by the eſtabliſhment of veterinary ſeminaries, the art aſſumed a more regular and ſcientific form, its attainments were by no means adequate to its opportunities; which was almoſt wholly owing to an obſtinate adherence to the humoural pathology, by which the treatment of internal and acute diſeaſes, continued inert and unſuccefsful. Their preſcriptions were filled with decoctions of ſimples, and they were utterly unacquainted with the medicinal virtues of the more active remedies in uſe among us. Under an opinion that the blood and humours were the conſtant ſeat of diſeaſe, they were continually waſhing them ſweet with correctors, entirely ignorant or unmindful of the derangements of the ſolids; and of the connections between living blood and living veſſels. Nor did this influence only their treatment of internal and acute diſeaſes; but even of local and chronic affections: hence their mode of treatting farcy, greaſe, and other complaints of a ſimilar nature, were equally inert; and all evinced an erroneous pathology. Upon a careful and unprejudiced review of the ſtate of farriery among ourſelves, and the continent of Europe; I am not inclined to think it had any advantages of moment at the beginning of the war in their favour: though it muſt be owned, we are indebted to them for many improvements; and for the firſt hints towards the eſtabliſhment of a regular ſchool of the art among us. Since the war, our means of communication are ſo few, that we are unaware of what is doing among our neighbours; but I have underſtood that in France, they are become much devoted to the pathology of Cullen, which will lead to an adoption of the improvements of Mr. Hunter, and when by theſe means the errors of the humoural pathology are baniſhed from among them, they will, I make no doubt, rapidly advance towards perfection: and other nations will probably copy their example. In Germany, where this ſyſtem has gained more ground, the advantages have been already much felt.——But though farriery, as a branch of veterinary medicine, has kept nearly equal pace with its continental improvements, I do not think the treatment of other animals, particularly of oxen, cows, and ſheep, has been equally attended to; and, in this particular, I am diſpoſed to think we are behind hand with them. Their ſevere viſitations of the epizootic diſtemper have made them more attentive to this branch of the art.

SECTION III.

Hiſtory of Veterinary Medicine in Great Britain.

THE veterinary art in this, has been ſimilar to that of other countries; buried in the groſſeſt ignorance; and moſt of our improvements we have been content to borrow from our neighbours. During the 17th century, manege riding was very prevalent in this kingdom, which we likewiſe copied from our continental friends, and conſequently we had German and French riding maſters in abundance, who took the direction not only of the actions, but of the health of the animal into their hands; by which domeſtic improvement became neglected, and foreign publications alone ſtudied. But as horſe-racing and hunting became prevalent, ſo the manege declined among us; and the treament of diſeaſes remained yet in the hands of thoſe immediately placed about the animals: which, as grooms and blackſmiths are uſually leſs enlightened than riding maſters, ſo it was a retrogade ſtep to improvement; and now and then only, was there a feeble and individual attempt to reſcue this noble art from oblivion: which effort ſoon ceaſed to attract attention, and ſtill ſooner to excite amendment.

Blundevill appears to have been one of the firſt writers worthy of notice in this country: he lived in the reign of Elizabeth. His work appears chiefly a compilation of antient writers, of which he tranſlated ſeveral into Engliſh: his ideas were fettered with his attachment to the manege, and conſequently introduced the errors and abſurdities with which that ſyſtem was then prevalent. There is a very full account of him in Mr. J. Lawrence's publication. We are informed of other writers of inferior merit ſubſequent to him; as Maſcal, Martin, Clifford, Burdon, on whom Bracken publiſhed notes, and others. Nearly about this time lived the celebrated Gervaſe Markham, whoſe treatiſe on farriery, though ſtrictly empirical, and groſsly abſurd, went through numerous editions, and became the guide and way-poſt of almoſt every practitioner, though it is more than probable, that Vegetius at that time had been tranſlated into Engliſh, who would have proved a much ſafer guide. Mr. Lawrence gives ſome copious extracts from this book, by which its merits may be appreciated.——It is now a few years ſince, being deſired to examine a horſe belonging to Lord Chetwynd, his groom, as a matter of great favour, indulged me with a ſight of his receipt book: among which were the following from Markham, which he aſſured me with much earneſtneſs had never failed him. *A noſtril drink.* Rue, ginger, ſweet oil, and vinegar, mixed and injected up the noſe, cures all dry colds, and ſtuffings in the head. *A drink for farcy*: rue, hiſſop, and wormwood, mixed in urine. *A receipt for the pole-evil*, urine with a hot iron quenched in it. For farcy or glanders, ſew up quickſilver in one ear: with many other remedies and recipes, equally efficacious, and ſcientific. It will therefore not be wondered at, when it is proved that theſe receipts are yet practiſed among grooms; that Lord Pembroke ſhould ſay. "Whoever lets "his farrier, groom, or coachman, ever mention "any thing more than water gruel, a clyſter, or a "little bleeding; may be certain to find himſelf "ſhortly on foot:" yet this wretched publication was tranſlated into French, 1666. Some years after this appeared the *Vineyard of Horſemanſhip*, by Michael Baret, of which I know nothing. During the reign of James the Firſt, there were many other leſſer publications, ſome of them originals, and ſome tranſlations from the Italian, German, and French. Among the former, De Grey is more generally known. The next in order, appears to to have been the ſuperb work on horſemanſhip, by the Duke of Newcaſtle, and which was tranſlated into French in 1737, and ſoon after into Dutch, German, and Italian, and appears to have been the moſt elaborate compoſition on this ſubject ever wrote, but has little connection with the veterinary ſcience. Succeeding this, appeared *The Anatomical Treatiſe on the Horſe*, by Snape, who was farrier to

Charles II. His plates are copies from Ruini, and ſome of them from Saunier; but not ſo well executed: his deſcriptions are likewiſe taken from theſe authors; and where he has deviated from them, he has made the human body his guide. In his deſcription of the eye, he mentions nothing of the membrana nictitans, and deſcribes the omentum as reaching to the pelvis; with numerous ſimilar inſtances: it is ſaid he projected a larger work, on diſeaſes which he never lived to execute. About this time an epidemic contagion raged among the black cattle of this country, which produced many publications on the ſubject; one of which was much read, and is ſtill in many perſons' hands, by Dr. Layard, which was afterwards tranſlated into French.

In the reign of George I. Sollyſel's celebrated work was tranſlated from the French, which had in ſome meaſure an influence in combating the general errors at that time prevalent: for at this time, though Vegetius was well known in this country, the practice of farriers was groſsly barbarous and ignorant.

It was very cuſtomary in ſome diſeaſes to tie or bar the veins. In the founder the legs were tied, that the inflammation might not proceed upwards: which inevitably occaſioned mortification, or loſs of the hoofs. In affections of the head, the cervical ligament was bored through with a hot iron, and the pole evil frequently produced. A cough raiſed a ſupa ſuppoſition, that the horſe had ſwallowed feathers, or hen's dung, and he was treated as ſkillfully as ſuch an ingenious ſuppoſition would dictate: this among grooms is not yet done away. A ſtumbling horſe had his noſe ſlit. Some diſeaſes were ſuppoſed to be occaſioned by the bite of ſhrew mice; and even to this day, among country people, the fern owl or eve jar, is ſuppoſed to inflict a diſeaſe on calves as it flies, by ſtriking them, but which it is known is occaſioned by a ſpecies of œſtrum or gad fly. The hedge hog lay under the obloquy of ſucking cows, and I remember to have ſeen, when I was boy, a rabbit ſaid to be poiſoned by rats ſucking her. A perſon aſſured me, he was witneſs to ſtones being tied up in a horſe's ear, ſome years ago in Wales, to make him go faſter: and in the old books of farriery, one reads numerous directions to uſe notched ſticks in a ſlit of the ear, to ſew up powdered glaſs in an opening of the ſkin, with other equally cruel and abſurd practiſes. It is therefore evident that Sir William Hope's tranſlation of Sollyſel; muſt have contributed greatly among the intelligent, to place theſe errors in a proper point of view. About the middle of the laſt century, the art experienced conſiderable improvement by the labours of Mr. Gibſon, who was originally a ſurgeon to a regiment of cavalry; from which ſituation it is probable he was firſt led to turn his attention to the diſeaſes of the horſe; and by which he was at length enabled to preſent the beſt treatiſe on farriery that had appeared in the Engliſh language: it is ſaid he afterwards lived in Duke ſtreet Groſvenor Square, where he practiſed with great reputation. He appears to have written ſeveral books; but his principal work is that above alluded to, which was publiſhed in quarto, with anatomical plates, copied from Snape or Ruini; and called *The Farrier's Guide*. But Mr. Gibſon and his cotemporaries, and indeed the whole of his predeceſſors always began where they ſhould have ended: they gave rules for the treatment of diſeaſes, but they never taught what diſeaſe was, by explaining the ſtructures, functions, and oeconomy of the animal body when in health. What uſe therefore Gibſon was to the art, aroſe only from the ameliorated ſyſtem thoſe would purſue, into whoſe hands his book fell; but enquiry was not ſtirred up, and the improvements he pointed out, there reſted: it was a ſuperſtructure without a baſe, conſequently nothing more could be built on it: it was an empirical practice, without a poſſibility of ratiocination; which, however proper in the darker ages, when there were no data to ground opinions upon, would now be deſtructive to the beſt intereſts of the ſubject. But though his anatomy was incorrect, and treated in ſuch a manner as to be uſeleſs; yet his treatment of diſeaſes was generally very judicious, and his account of ſymptoms accurate and intereſting: and as he was guided moſtly by his own obſervation, ſo he became the beſt writer and practitioner, that this country had produced.

As a cotemporary with him, lived the celebrated and eccentric Dr. Bracken, who was a phyſician of great abilities, and extenſive knowledge in his profeſſion; a man of conſiderable erudition, a ſportſman, and a wit of a peculiar caſt. His works have, by ſome, been as much admired and read, for the peculiar ſtyle in which they are written, and that peculiar freedom, and non-obſervance of rule or form, as for the real information they contain.

Though there is great ingenuity in his writings, and though in many reſpects, he improved upon Gibſon, yet as a practical work it was much inferior; nor was his information given in a way that could benefit the generality of his readers: independent of his ſtyle being too peculiar, and his reaſoning too abſtruſe for farriers, his manner of purſuing his ſubject was ſo deſultory, that few readers had patience to follow him. Nevertheleſs his works, which were ſeveral, and paſſed through many editions, have raiſed him a fame that can only die with the ſcience.

Bartlet was a ſucceſſor to the two former, and was likewiſe a ſurgeon, who formed himſelf on the model of Gibſon and Bracken, culling all their excellencies, and giving the ſum of their treatment, in a much more compendious form, and wholly practical. Bartlet likewiſe enriched his works, and benefited the art, by tranſlating La Foſſe's improvements and diſcoveries. But he was ſimply a copyiſt and compilator, and attempts no addition of his own, but an alteration in the mode of nicking; which it is ſurpriſing that a man of ſenſe, and educated as a ſurgeon likewiſe, ſhould think of recommending, as it was a cruel and dangerous mode, and conſiſted in bending the tail back on the body, and faſtening it there by means of a machine. La Foſſe, in his *Guide du Maréchal*, ſufficiently ſhews the impropriety of this practice, and ſays he has ſeen the worſt conſequences enſue from its uſe. It is eaſy to ſee, that Bartlet had not, when he wrote the firſt editions of his work, ſeen much practice; and throughout the whole, it is evident he had paid no attention to the anatomy of the horſe; he even fails in attempting the deſcription of the tail, which ſhould have been his particular ſtudy. Beſides his *Gentleman's Farriery*, he publiſhed a *Veterinary Pharmacopœia:* the former work was tranſlated into French. Bartlet's principal help to the art, was the introduction of a much better mode of ſhoeing, or at leaſt of managing the feet, by his tranſlation of La Foſſe.

To him ſucceeded Oſmer, who was likewiſe bred a ſurgeon, but practiſed the veterinary art in Oxford Street. He appears to have been an eccentric but very ingenious man. His *Treatiſe on the Lameneſſes of Horſes*, with an improved mode of ſhoeing, is moſt deſervedly eſteemed. His ſyſtem of ſhoeing, perhaps receives its greateſt compliment, when it is known that it is that adopted by Mr. Morecroft, with very trifling alterations. He firſt commented upon La Foſſe's method, pointing out the excellence of his mode of treating the feet, but that the ſhort ſhoe was inadequate to the ſupport and protection of the foot in the preſent improved and hard ſtate of our roads. The practical part of this treatiſe on lameneſſes is likewiſe excellent, but his reaſoning is ſometimes defective.

From the above works there were ſoon many compilations made, which were generally below mediocrity: amongſt which, one called the *Farrier's Dictionary*, though a very wretched compoſition, met with a very rapid ſale. I muſt except from theſe, a ſmall treatiſe by a Mr. Blount, ſurgeon, which is above the common claſs, and worthy of notice, from an ingenious contrivance depicted on a plate, for ſecuring a fractured limb. Mr. Clarke, of Edinburgh, the king's farrier for Scotland, ſoon after this gave the world his excellent *Treatiſe on Shoeing and Diſeaſes of the Feet*; and which has been ſince followed by one on the *Prevention of the Diſeaſes of the Horſe*, which work no perſon ſhould be without who ſtudies this ſubject. Nearly at the ſame time, or very ſoon after, the public were indebted to Lord Pembroke, whoſe work, though profeſſedly written on the management of dragoon horſes, contains ſome excellent obſervations on ſhoeing, and the general treatment of the animal.

Lord Pembroke derived the principal of his medical hints from Mr. Clarke. Whether it was previous or ſubſequent to the appearance of theſe latter publications, that Mr. Stubbs publiſhed his elegant *Plates of the Anatomy of the Horſe*, I have not at this moment the means of aſcertaining; but it was much about this period. Mr. Stubbs was a very eminent horſe painter, and to a high profeſſional excellence in his art, added a very conſiderable knowledge of the animal frame, particularly of the horſe: but Mr. S. appears to me to have gone too far as a painter, and not quite far enough as an anatomiſt. Conſidering how little aſſiſtance this gentleman could gain from former authors, one is ſurpriſed at his correctneſs, and if there appears ſome parts not ſo correct, it cannot be wondered at. The names of the parts are made to follow the human too cloſely, and the references puzzle and bewilder; add to which the expence prevented its general uſe. I have underſtood this gentleman is now engaged in ſome comparative part of anatomy. From theſe periods, till the eſtabliſhment of the veterinary college, the attention of the public was occupied by Mr. Taplin. This gentleman likewiſe began his career as a ſurgeon, but turned aſide to the then more profitable track of farriery. Mr. T. ſet out by decrying all that had gone before him, all that were in practice with him, and in fact, every thing that has been done by any one ſince. Yet Mr. Taplin's works are ſaid to be compilations from thoſe very authors whom he abuſes, and in ſome inſtances, after abuſing egregiouſly, he copies literally. Unfortunately for this gentleman, from ſome late improvements, the people of this country have learned to diſtinguiſh in this art as well as in others, between ſcientific inveſtigation and verboſe quackery. Had Mr. Taplin ſet out by ſtudying the ſtructure and œconomy of the animal, he might, and undoubtedly would have proved an ornament to the profeſſion; but when he permits his works to go through ſo many editions, in the face of criticiſms from all quarters, with a chapter on diſeaſes of a part that has no exiſtence in the horſe, i. e. *the gall bladder*, we muſt be aware that he is entirely ignorant of that, upon which every pretenſion to profeſſional merit muſt be grounded. Mr. Taplin indulges himſelf in the moſt unreſtrained freedoms in ſpeaking of thoſe who have gone before him, yet copies verbatim from them; he cannot wonder therefore that he has been treated with conſiderable ſeverity by later writers; nor can he be ſurpriſed that a practice ſo begun and ſo continued, has ended as his has.

Hiſtory of the Veterinary College.

I now come to a period, from which the principal improvements in this art muſt be dated, and which will ever remain a memorable epoch to the veterinary amateur: this was the eſtabliſhment of the *Veterinary College*. We are informed in Monſieur St. Bel's works, he was born at Lyons in France; that he became junior profeſſorial aſſiſtant to the royal veterinary college, and afterwards anatomical profeſſor to the veterinary college at Montpelier; but that the commencement of revolutionary principles in France induced him to come to this country, where he had before been in 1788, and publiſhed propoſals for inſtituting a veterinary ſchool, but without ſucceſs. His ſecond viſit, in 1790, was more ſucceſsful; for on his again renewing his propoſals, they were noticed by the agricultural ſociety of Odiham in Hampſhire, which had lately entertained the intention of ſending two young men into France, to ſtudy the veterinary art; but on their acquaintance with Monſieur St. Bel, they gave up this idea, and appointed a committee of gentlemen to conſult with him on the means of puſhing into effect a plan that might tend to eſtabliſh farriery on a ſcientific and rational baſis. Theſe gentlemen, with ſeveral others, who ſaw the utility of ſuch a meaſure, uniting, propoſed to form an inſtitution, called *The Veterinary College of London*, and to appoint Monſieur St. Bel to the profeſſorſhip.

From the firſt appearance of this inſtitution forming itſelf into a regular eſtabliſhment, the number of ſubſcribers daily encreaſed, and a general meeting being formed, the following noblemen and gentlemen were choſen preſident, vice-preſidents, and directors.

Preſident,

His Grace the Duke of Northumberland.

Vice Preſidents,

Earl Groſvenor
Earl Morton
Earl of Oxford
Lord Rivers
Sir George Baker, Bart.

Sir T. C. Bunbury, Bart.
M. P.
Sir Will. Fordyce, Knt.
and
John Hunter, Eſq.

Directors,

Sir John Ingleby, Bart.
M. P.
Sir H. P. St. John
Mildmay, Bart.
G. M. Aſcough, Eſq.
Mr. John Baynes
Mr. J. Burgeſs
Rev. T. Burgeſs
Rev. J. Cook
Dr. Adair Crauford

John Gretton, Eſq.
Dr. Hamilton
Mr. Rennet
Dr. D. Mapleton
Granville Penn, Eſq.
Mr. William Stone
Edward Topham, Eſq.
Dr. Williams
and
J. Wollaſton, Eſq.

Treaſurers,

Meſſrs. Ranſom, Morland and Hammerſly.

Soon after this a houſe was taken at Pancras, and pupils were admitted to board; but from the difficulty of regulating the concerns, and probably from ſome domeſtic reaſons, the profeſſor did not at firſt puſh into effect any active or regular ſyſtem of inſtruction, which tended to ſink the inſtitution in the minds of many. Monſieur St. Bel was a man of conſiderable ſenſibility, and this joined to ſome pecuniary embarraſſments, appeared always to prevent that energy he might otherwiſe have evinced. This inſtitution, though one of the moſt uſeful to this country, was very unfortunate from its outſet. It was arranged and conducted by perſons totally oppoſite in their characters and habits. To me, it has ever been a matter of ſurpriſe, that it was eſtabliſhed at all, with Monſieur St. Bel at its head. That he was an ingenious man, and that he probably underſtood the manege, and was indefatigable in promoting the intereſts of the college, no one will deny; but no one of thoſe who moſt ſtrongly ſupported him, will believe that he was fitted for his ſituation. His treatiſe on ſhoeing was ingenious, and he, I believe, had made himſelf well acquainted with the principles and practice of this branch of the art; but the part which treats on the diſeaſes of the horſe is a full proof of what I have advanced, and which never, I believe, ſold out the firſt edition. It muſt have been only from a wiſh that the college might be eſtabliſhed, and from a ſuppoſition, that no perſon then in the kingdom was able to undertake its management, that his examination, which took place in 1792, by Sir George Baker, Dr. Crauford, Dr. Packwood, Mr. Hunter, Mr. Cline, Mr. Horne, Mr. Vaux, Mr. Sheldon and Mr. Peake, was paſſed over as ſatisfactory.

Neverthelefs, Monſieur St. Bel was poſſeſſed of ſuch good natural abilities, he had the welfare of the inſtitution ſo much at heart, and I believe when his mind was at eaſe, had ſo much application, that I make no doubt his deficiences, had he lived, might have been in a great meaſure made up. In March 1792, it was reſolved, that a temporary ſtabling for fifty horſes, and a forge for ſhoeing, ſhould be built near the houſe taken for the college. From this time the inſtitution became embarraſſed, in conſequence of the improper management of its funds, yet it proceeded with ſome kind of vigour, and much was hoped from it; and had its profeſſor lived, his indefatigable attention might have in the end emancipated it: though the death of ſome, and the ſeceſſion of others of its firſt friends and founders, contributed to wound a mind not fitted to ſtruggle with diſappointments. But in Auguſt 1793, Monſieur St. Bel was attacked with an illneſs, which proved fatal in about a fortnight. His remains were interred in the vault of the Savoy chapel in the Strand, at the expence of the veterinary college.

Monſieur St. Bel's works were an *Eſſay on the Geometrical Proportions of Eclipſe*; *Lectures on the Elements of Farriery*; the *Art of Horſe Shoeing, and Diſeaſes of the Feet*. And *a volume of poſthumous works*, collected for the benefit of Mrs. St. Bel. It is a very proper and a very generous ſentiment, to ſpeak nothing but good of the dead; but the cauſe of truth is ſuperior, and ſcience riſes by competition; if thoſe who add nothing to it gain as much fame as its beſt friends, who will waſte their days and nights in arduous reſearch. I have ever been ſurpriſed, that a perſon that did not either want ſenſe or art, would render himſelf ſo open to the ſuſpicion of ignorance, by offering to the public, as his own, what was copied, with little variation, from authors that muſt eventually fall into moſt perſons' hands. Nor is it leſs ſurpriſing theſe productions ſhould have gained the attention they did. The treatiſe on the Geometrical Proportions of Eclipſe appeared ſoon after Monſieur St. Bel became known, and paved the way for his future promotion, by gaining him many admirers and patrons.

It aſſumed the elegance of its ſtyle by the aſſiſtance, I believe, of the accompliſhed Mr. Penn, a deſcendant from the colonial founder of Pennſylvania: the ſubject matter itſelf may be ſeen with little alteration, in the firſt volume of Bourgelat's Elemens d'Hippiatrique, publiſhed at Lyons in 1750; where the ſame tables and the ſame proportions nearly appear. It has been proved likewiſe by the elegant eſſay of Mr. Wilkinſon on the Motive Power of Animals, that his admeaſurement was incorrect, and conſequently his whole theſis erroneous: this ſubject will be more fully noticed in our obſervations on the ſkeleton. Nor can his Lectures on the Elements of Farriery claim any greater originality; not only the ſubſtance, but frequently

a literal

a literal tranſlation of La Foſſe appears in them, collected from the Dict. d'Hippiatrique. That this is the caſe may be eaſily proved by comparing theſe works. As one inſtance, let the deſcription and treatment of quittor be taken. I mention this, becauſe it was a ſubject on which both have been greatly admired, but on which both were egregiouſly faulty. With regard to his poſthumous works, if they have any greater claim to novelty, it is, I think, unfortunate for them. The prize diſſertation on greaſe, which we are informed, gained the medal at Lyons, would induce me to regard the inſtitution it was granted by, with ſome degree of contempt. On diſſecting ſubjects who have died of greaſe, Monſieur St. Bel ſays, "I have in general "found them wholly lean and emaciated; the viſ"cera of the lower belly dry and full of obſtructions, "more eſpecially the meſentry and pancreas, the "liver ſchirrous and rotten, much hard excrement "in the great inteſtines, the ſmall guts contracted "and ſometimes containing whitiſh worms, the "ſtomach corroded by bots, the lungs affected and "covered with tubercles filled with chalky matter, "the pituitary membrane ſpongy, &c." In our author's account of the death of Eclipſe, we find ſome ſimilar inſtances of his acquaintance with morbid anatomy. Eclipſe died of cholic. With other appearances, he ſays, "the glands were much "ſwelled, the blood veſſels filled with thick black "blood without ſerum, the bladder was empty,

" except of ſome matter from the ureters, which " corroded the villous coat. The animal died " from a defect in the functions of the veins and " a violent inflammation of the bowels." Glanders, Monſieur St. Bel did not deem purely " local af- " fection." He ſays, " I cannot conceive why it " ſhould ſtop at the pituitary membrane, without " going down the wind-pipe and the bronchias; nor " do I ſee any reaſon why it ſhould not fix on the " lungs, &c. It is reaſonable to conclude, that the " poiſon circulating through the whole maſs of hu- " mours, particularly affects and injures the lymph, " that nature provides it a paſſage through the pitui- " tary membrane, &c." On cholic, we find, " The " cholic or gripes are occaſioned by the irritation of " the nervous fibres, the contraction of the capillary " veſſels diſtributed through the inteſtines, and by " the obſtruction produced in thoſe veſſels by the " ſtagnation in the blood and humours." The treatment is, " to bleed, then give half a pint or " more of caſtor oil; preparing immediately the " following looſening and emollient drink: Boil in " ſix quarts of rain, river, or in any ſoft water, " twenty minutes, and give a quart of the decoc- " tion every hour or two, of the following herbs: " mallows, mullein or cow's lungs wort, bear's " breech, pellitory, lettuce, allgood or Engliſh " mercury, and ſorrel, of each a handful." With ſuch a ſyſtem of pathology much was not to be expected from the firſt profeſſor. In proportion as any perſon's ſituation becomes exalted, his errors become dangerous to ſociety, as they are more generally received, and exactly in this proportion, is it more neceſſary to point them out, that their pernicious tendency may be prevented.

After his death, the profeſſorſhip was intended, I believe, to devolve jointly on Mr. Coleman and Mr. Morecroft. The former gentleman was a very ingenious ſurgeon, who had diſtinguiſhed himſelf by his phyſiological enquiries, particularly into the cauſes of ſuſpended animation. The latter was likewiſe a very ingenious medical man, who had lately returned from France, where he had been attending the veterinary ſchools. Under ſuch a coalition, there was a moral certainty that the ſcience would rapidly advance; to which the love of experimental enquiry in the one, and the practical abilities in the other, would ſo powerfully tend. But in the end, the whole fell on Mr. Coleman, who was conſtituted ſole profeſſor. The general eſtabliſhment now received ſome new modulations; a handſome theatre was compleated, with a muſeum and diſſecting rooms for the uſe of the pupils; a medical committee of aſſiſtance was appointed, conſiſting of

Dr. Fordyce
Mr. Cline
Mr. A. Cooper
Dr. Bailie
Mr. Abernethy
Dr. Babington
Mr. Home
Mr. Houlſton
Dr. Relph.

By theſe gentlemen the pupils were to be examined, and if found to have acquired a ſufficient knowledge of the art, certificates were to be granted them.

It was finally determined, that an annual ſubſcriber of two guineas ſhould have the privilege of ſending two horſes to the college, to receive medical aſſiſtance, the proprietor paying for keeping only. A ſubſcriber of twenty guineas has this advantage made perpetual.

Pupils were admitted into the college, where they are boarded on moderate terms or not, as it ſuits them, and receive all the benefits of the inſtitution for twenty guineas. They have the advantage of the lectures of the profeſſor, on the anatomy of the horſe, and the theory and practice of the veterinary art in all its branches. They ſee the practice of the college on the ſubſcribers' horſes, and have the aſſiſtance of the profeſſor or his aſſiſtant, in their diſſections; for which there are appropriate conveniences. Beſides which, the pupils have a moſt eminent advantage from the liberality of the diſtinguiſhed characters who compoſe the medical committee; of attending their lectures gratis. Such an inſtance of generous attention to the public good, deſerves every poſſible praiſe, and is a characteriſtic mark in moſt of the preſent profeſſors of human medicine. A tribute ſhould not here be paſſed over without being paid to that moſt ſpirited promoter of every branch of the healing art, Mr. John Hunter. Veterinarians will ever remember with gratitude, how much they are indebted to him for his zealous promotion of this eſtabliſhment.

For ſeveral years parliament has annually voted a ſum for the ſupport of this inſtitution, and what has tended much to the advancement of the art, has been his Majeſty's granting veterinary ſurgeons the rank of commiſſioned officers, by which moſt of the regiments of cavalry have now become furniſhed with ſome gentleman educated at this moſt uſeful ſchool; and there are but few of the larger towns in the kingdom that do not experience the benefit of this eſtabliſhment, by having a pupil of the college ſettled in them.

Mr. Coleman's works, ſince his becoming profeſſor, are *Obſervations on the Structure, Œconomy, and Diſeaſes of the Foot of the Horſe*; *and on the Principles and Practice of Shoeing*. Vol. 1ſt. 4to. This work is to be continued, for which the plates are preparing, and when compleated, will form a moſt uſeful and elegant production. Mr. Coleman has likewiſe publiſhed a pamphlet *On the Formation and Uſes of the natural Frog of the Horſe, with a Deſcription of a patent artificial Frog.*

I have thus given the hiſtory of the *Veterinary College* to the preſent time, what its effects have been upon the art, I ſhall examine preſently. I muſt now, for the ſake of regularity, take up the general account of the publications that have appeared on this ſubject, from the period of the eſtabliſhment of the inſtitution I have been deſcribing.

In 1790, Mr. Proſſer, a gentleman engaged in the practice of phyſic, advertiſed his intention of practiſing farriery; and as a previous ſtep to it, publiſhed a *Treatiſe on the Strangles and Fevers of Horſes.* It contains ſome judicious remarks on other authors, but offers little original matter. Mr. Taplin likewiſe produced, at various times, other publications, which were exact counterparts of his *Gentleman's Stable Directory.* One of theſe, remarkable for its neatneſs of appearance, called *multum in parvo,* appears to have been ſimply intended as an advertiſement of Mr. T's. infallible *Prepared Horſe Medicines*; one ſpecimen is ſufficient: he recommends, *balls for the inflammatory cholic,* "which "need no collateral aid, but briſk action and fric- "tion."

If Mr. T. can only procure one authenticated caſe of his balls removing inflammation of the bowels, with the aſſiſtance of briſk action without collateral aid, I muſt add, that all the eminent men from the time of Hippocrates to the preſent moment, have obſerved and ſtudied to no purpoſe; they have been the promoters of error, and the propagators of falſehood; if he cannot, the inference is plain. The ſubject would be below my notice, but that innumerable are the miſchiefs ſuch profeſſions occaſion. In 1796, appeared a very elegant work in quarto, the production of S. Freeman, Eſq. an amateur in the manege, and a gentleman of fortune, learning, and great ingenuity. This publication conſiſted in *a Deſcription*

Deſcription of the Structure and Œconomy of the Foot; accompanied with a ſet of plates highly finiſhed, in Skelton's beſt ſtyle. The ſubjects were diſſected under the inſpection of Mr. Home, or an aſſiſtant, and except ſome ſlight errors in the ligaments of the navicular bone, appear very correct. This publication, for the elegance of its engravings, and the general ſpirit of the whole, will be long without a competitor. It recommends a very ingenious mode of ſhoeing; and the œconomy of the foot is likewiſe highly ingenious, though it will be ſeen in the courſe of this work, that we have ventured to differ from Mr. Freeman in ſome points.

A Mr. John Lawrence about this time publiſhed a ſmall volume, containing extracts from Monſieur St. Bel, Oſmer, Clarke, and Lord Pembroke. In 1798, this gentleman brought forward a *Philoſophical and Practical Treatiſe on Horſes*, and on the moral duties of man, towards the brute creation, in two volumes. The part of this work on the general treatment of the horſe, is humane and intereſting. In the part that attempts to deſcribe the treatment under diſeaſe, as Mr. Lawrence owns his ignorance of the ſubject, and faithfully notices his authorities, he becomes no farther anſwerable for the errors, than as theſe errors by his means become more widely diſſeminated.

In 1800, Mr. Morecroft publiſhed a ſmall pamphlet with a "*Curſory Account of the various Me-*
" *thods*

"*thods of ſhoeing Horſes, with incidental Obſerva-*" *tions.*" Any remarks on this production would be unneceſſary; the ingenuity of the author is well known. The mode of ſhoeing recommended will be noticed in the courſe of the work. This year likewiſe produced a vindication of the preſent practice of farriers in a pamphlet by Mr. Lane; I ſhall only remark at preſent, that if this gentleman was delegated by the body general; they could not have been more unlucky in their champion. It was one thing to reprobate the abuſe caſt on them, but it was another to ſupport and vindicate their abſurdities. I ſhall have occaſion to notice this publication more fully by and by.

In the beginning of the preſent year, Mr. White, veterinary ſurgeon to the 1ſt regiment of dragoons, gave to the public a very uſeful *ſmall Vade Mecum of Farriery* which appears to be principally compoſed from Mr. Coleman's lectures.

This year likewiſe produced a work of conſiderable elegance from the pen and pencil of Mr. Richard Lawrence, of Birmingham, veterinary ſurgeon. It is much to be regretted that a gentleman who appears to poſſeſs ſo much ingenuity, ſhould paſs, over ſubjects of ſuch importance in ſuch a light curſory manner. The deſcription and treatment of ſome diſeaſes occupy fewer lines than (to treat the ſubject in ſuch manner as to prove uſeful) they would require pages. The plates are elegant, and extremely well deſigned, particularly thoſe that regard the proportions and paces of the horſe; thoſe that regard the internal ſtructure and diſeaſes are not ſo happy. The diction is very ſuperior, and as a cabinet work it is moſt certainly elegant and intereſting; but as a uſeful aſſiſtant to the art itſelf, it does not rank ſo high.

Theſe, I believe, form nearly the whole of the publications, entitled to notice, that have appeared in our language: there have been ſeveral others of leſs note, ſome of which have fell under my inſpection, but do not deſerve attention, others I have not ſeen, but thoſe I have deſcribed are the only works of any degree of celebrity. I had forgot to mention a quarto work publiſhed about the year 1797, by Mr. William Griffiths, "forty years groom "to Sir William Wynne, Lord Egremont, and "other noble perſonages." On looking into it, I found here likewiſe a chapter dedicated to diſeaſes of the gall bladder: of the *pretenſions* and *merits* of this work I need ſay no more. There appeared about the ſame time, likewiſe a quarto publication by Snape, which was in ſome degree ſuperior to the former.

In point of date, I ſhould have noticed before, Mr. Downing's publication on *the Deſcription and Treatment of the Diſeaſes of Cattle*; as it appeared four or five years ago: but as this work is almoſt the only one of the kind on this branch of the veterinary art, and as it was regarded as a very meritorious production among farmers, graziers, and ſome farriers, and may be regarded as a very faithful picture of the general ſtate of veterinary medicine, as at preſent exiſting, and practiſed among the greater part of farriers and cowleeches. I have deferred the conſideration of it to this place, which I ſhall here do pretty fully.

The ſyſtem of veterinary medicine I propoſe offering, is upon a plan entirely new to any thing that has been given. I do not mean to ſay from its ſuperior merit, but from its plan ſolely. It may be gathered from what I have ſaid concerning the older authors, that though ſome of them were elaborate works, the productions of men of ſenſe and judgment, and contained nearly the whole knowledge of their time; yet from the manner in which they were written, their benefits were only temporary; they taught farriers to act, but not to think. ——There are certain diſeaſes known to them all, as farcy, ſtrangles, greaſe, &c. in theſe caſes they had rules of practice to go by: but as they only knew the exiſtence of diſeaſe, but not its cauſes, ſo if any unuſual complaint, or even any unuſual ſymptom occurred in a common diſeaſe, they were at a loſs, nor could they proceed, except blindly, for their text book reached no farther; they had no receipt for ſuch a malady. Therefore to teach the ſcience properly, there muſt be a ground work laid down; the anatomy of the animal muſt be known, and the laws of the animal œconomy, its deviations from health, the cauſes of theſe deviations, the progreſs of return towards a healthy ſtate, and the modes of haſtening this return. By theſe means practitioners will be taught firſt to think, and then to act; and inſtead of only having a ſyſtem of farriery in their cloſets, it will exiſt in their minds: they will then have no boundary chalked out to their improvement, which at preſent they have; for they cannot go beyond their text book. The former works are not direction poſts to improvement, but are themſelves the extent of what they profeſs to teach. Hence, therefore, till the eſtabliſhment of the veterinary college, farriers could only be automatons, they could only act as directed by others: but by this uſeful inſtitution, they are taught the principles of the art, not in a mechanical, but in a ſcientific manner; and to ſuch as cannot avail themſelves of this advantage, I have endeavoured in ſome meaſure to ſupply the want, by an arrangement of inſtruction, tending to lead the mind gradually to an exerciſe of its own powers, to the final attainment of this uſeful art. But to proceed ſyſtematically in ſuch an undertaking, I muſt, it is evident, firſt ſhew that the art is as defective among us as it is at preſent practiſed; and to do this, I muſt give the hiſtory of the art, and produce not only the practice of the farriers, but what forms a picture of this practice, their inſtructions: to this end I muſt be allowed freely to examine their ſeveral productions, at which no one ought to take offence: the attack is never made upon the perſon, but on the opinion, and we war againſt error as readily in our brother as in our enemy, when it is the cauſe of truth only we ſeek, and no perſonal motive influence us.

In what I have offered, and in what I have to offer, I am ſtimulated only by the cauſe of truth. I have no perſonal knowledge of any of the individuals whom I have or mean to mention; therefore I have no reaſon for invective, no attacks to make upon perſons who I may ſuppoſe have injured me, nor have I any invidious motive to gratify; but it is a duty I owe the public, the ſcience, and myſelf, to expoſe error wherever I meet with it. This will form the firſt means I ſhall make uſe of, to ſhew the neceſſity of a more ſcientific purſuit of the ſcience, than has hitherto been adopted. The next means will be the advantages that have been already derived from this mode of purſuing it, and thoſe that may be expected to be hereafter derived from it, which, if I can eſtabliſh, I ſhall have ſucceeded in gaining my firſt ends; which are to evince the importance of the art, and to prove that it is not at preſent underſtood or practiſed in a manner ſo beneficial as it might be; which then leads me to the proſecution of my work to gain my ultimate end, which is to point out and teach the mode in which theſe benefits and advantages may be brought into general uſe.

I think it muſt be allowed, that all the authors among thoſe that have attempted to give regular ſyſtems on this ſubject, have failed in their object: they have not only purſued a wrong method of teaching the art, but they have, by not being converſant with the ſtructure and œconomy of the animal, widely diſſeminated error; and in proportion to their celebrity they have been more or leſs miſchievous. That branch of this art that takes in the diſeaſes of horned cattle, is in a more barbarous ſtate than even farriery: a better proof cannot be offered of this, than is given by the peruſal of a publication that lately appeared by Mr. Downing, cattle doctor, which, though enormouſly expenſive, ſold very faſt, and was very generally eſteemed among farmers and graziers. If Mr. Downing fancied he was in poſſeſſion of any valuable receipts for the cure of any of the common and well known diſeaſes of cattle, he did right to give them to the public; but he ſhould not have miſled, by abſurd reaſoning and the pathology of a ſchool boy; and it is a lamentable proof of the ſtate of this art among us, when we find ſuch doctrines and ſuch preſcriptions eagerly received.

Mr. Downing begins by deſcribing inflammation of the brain, in which he very properly directs bleeding, but he mars all the benefit of his practice, by directing this to be followed by diapente internally, and opium applied externally. If an ox or cow did not die under this treatment, both the owner and animal muſt thank the bleeding. Mr. D. then deſcribes a fever of the brain: what difference he would point out between two diſeaſes that in the animal need no diſtinction, I am not aware. It is true that ſometimes inflammation of the brain is idiopathic, at others ſymptomatic; but I believe this diſtinction did not enter into our author's intention. In the preſent ſtate of the ſcience, drawing a line between inflammation of the brain, and fever of the brain, would be putting on the cowl, before the chimney was built. A ſleepy fever or lethargy is then treated of, and next a giddineſs or ſwimming in the head, which Mr. D. deſcribes as "a diſtemper belonging to the cavi-"ties of the eyes and optic nerves; it gives a "wavering motion to the body; for if the optic "nerve, or its expanſion on the bottom of the eye, "called *retina*, be agitated by any preternatural "heat or other emotion, objects will change their "ſituation: therefore, this diſeaſe is a fever affect-"ing the cavities of the eyes, or the optic nerves." I need not to the moſt ſimple reader, point out the abſurdity of this deſcription; if ever he has been attacked with general fever, he has undoubtedly felt himſelf hot and his head ſwam; but he did not for a moment ſuppoſe the diſeaſe confined to his eyes: he might as properly upon this principle, on looking into his mouth and finding his tongue white, conclude he had a fever in his tongue, and fall to bleeding and bliſtering it. For this Mr. D. preſcribes ſnake root, valerian, rhubarb, and camphor, in doſes that would ſoon amount to the value of ſome beaſts, even at the preſent price. His account of the manner of action of theſe remedies, is not leſs curious; "they promote inſenſible perſpiration, and remove the grumes that ſtuff the veſſels, and ſuppreſs the neceſſary motion of the nervous fluid."

Mr. D. has thus found what the greateſt anatomiſt never detected; grumes in the veſſels, and fluid in the nerves: and if this nervous fluid had been diſcovered, it would be hard to conceive how he brings it into the veſſels of inſenſible perſpiration, which are uſually deemed arterial terminations.

Inflammation of the lungs or riſing of the lights, is ſaid to ariſe from cold "which corrugates the internal membranes, ſhuts up their excretory ducts, and hinders a due exhalation and perſpiration, of the ſurcharges from the retained perſpirables." Nitre, ſalt of tartar, elecampane, turmeric, and rhubarb are given in the cure. In this diſeaſe I had ſuppoſed moſt perſons were aware, that nothing is to be depended upon, but bleeding and bliſtering; whoever follows Mr. D's plan ſimply, will chance to find himſelf a beaſt, or a beaſt's price out of pocket.——For inflammation of the bowels or bloody flux, we find preſcribed pomegranate powder one ounce and an half, rhubarb half an ounce, diaſcordium half an ounce, alum one ounce, grains of paradiſe half an ounce, aniſeed one ounce, red wine a pint. In dyſenteric complaints, to a very ſtrong ox, this might not be attended with any bad conſequence; but in any affection of the bowels compounded with inflammation, this mixture would as effectually kill as an equal quantity of arſenic: and as the generality of Mr. D's readers cannot be ſuppoſed to make nice diſtinctions, and as none are attempted to be made for them, it is more than probable that ſuch an event will occur in the majority of caſes in which it is uſed. But in inſtances where coſtiveneſs is preſent, he has been more judicious in his directions.

In inflammation of the kidneys, though a very frequent complaint, our author has been even more erroneous: indeed, this is a diſeaſe which farriers in almoſt every inſtance treat in oppoſition to its true indication; and here is one great proof of the error and imbecility of the preſent practice of farriery, ariſing from a want of knowledge of the nature, ſtructure, and œconomy of parts. All glands under inflammation, have their ſecretions diminiſhed; when, therefore, inflammation of the kidneys takes place, little urine is ſecreted, and conſequently little evacuated, but the farrier, unconſcious of this well known law in the animal œconomy, ſuppoſes ſome ſtoppage to have taken place, and gives ſtrong diuretics: this always encreaſes the inflammation and the parts very uſually mortify in conſequence, and the animal is thus deſtroyed.

Exactly ſuch is Mr. Downing's practice, and exactly ſuch muſt be the event in the majority of inſtances, where nitre two ounces, caſtile ſoap one ounce, cream of tartar two ounces, oil of juniper one ounce, as he directs, is given in theſe caſes. I would not ſpeak thus ſtrongly, was it a point at all of opinion, but it is not better known that mercury is a cure for the venereal complaint, than that the mildeſt diuretics are deſtructive in inflammation of the kidneys. A chapter appears upon the *yellows*, *white water*, *long ſuf*, *gorgle in the elder*, and cows giving bad milk, which diſeaſes are deſcribed in one chapter, under one train of ſymptoms, and under one mode of cure: ſtrange as it may appear, yet it is literally true, that every one of theſe names were originally intended to expreſs very different diſeaſes; no leſs ſo than inflammation of the liver, both acute and chronic, inflammation of the inteſtines, of the kidneys, of the womb, and local inflammation of the udder; but as from a want of ſcience, when the ſymptoms of a complaint have been ſuch that the attendants have been uncertain to what diſeaſe they belonged, they have ſometimes uſed one name, at another time another, till they have become uſed indiſcriminately: and thus Mr. D. has given as a complaint that has different names in different counties, what any one may obſerve, and every one knows who is converſant with the diſeaſes of animals, is only a mixture of the predominant ſymptoms of theſe different diſeaſes; but which ſymptoms, as laid down, never occurred at one time in any animal, unleſs affected at once with all theſe complaints, which is morally impoſſible.

The flatulent cholic, we are told, is cauſed by cold winds or bad digeſtion, which are two cauſes rather different. “ The wind draws into the beaſt “ backwards, and returns with great noiſe.” Surely there are few perſons but are aware, that in conſequence of ſome circumſtances taking place in the ſtomach, a quantity of air is let looſe from the food, which, by diſtending the ſtomach and inteſtines beyond their capacities, or in ſome other way, irritates them, and occaſions flatulent cholic. No one but knows, that when an animal is hoved, it is not the ſimple quantity taken in that diſtends the paunch, but the air eſcaping occaſions the diſtention; if the air as freely entered in as it paſſes out, to what end does Mr. D. give what are termed carminatives. Such groſs errors as theſe repel all progreſs to improvement.

But it muſt be remembered in this account of Mr. Downing's publication, I only take it as a ſpecimen of the preſent ſtate of the art in general; it is not any particular attack on either Mr. D. or his book I intend; on the contrary, if by theſe errors much miſchief may be done, it is in a great meaſure atoned for, by his judicious remarks on extracting calves, which alone are certainly worth the price of the book.

If I was to add nothing to the preceding pages, I ſhould probably have ſufficiently ſhewn the neceſſity of a radical reform in the principles and practice of the veterinary art, and have perſuaded thoſe of my readers who were not before convinced, that it has been hitherto conducted without principles, hence has been without improvement, and its ſucceſs precarious. Nothing is more true, than that ignorance and obſtinacy uſually accompany each other, and this has not only prevented it hitherto advancing, but it now prevents proper principles being received when they are offered; hence farriers obſtinately hold out againſt improvement, becauſe they will not or cannot ſee their errors. How glaring this appears, is evident, when we find one of them ſaying, "Whatever may be ſaid by "thoſe new-fangled farriers, of the advantages re-"ſulting from a minute knowledge of anatomy, "nothing in their practice has proved its utility; "and as Gibſon has ſo well demonſtrated the ana-"tomical ſtructure of the horſe, nothing further on "the ſubject is neceſſary, and cannot tend to eluci-"date the practical part of farriery." Such an apology for ignorance on a ſubject that all writers in every age have allowed, is the ground-work of all improvement, could only be offered by the perſon it was made by. Facts cannot be reſiſted; few horſes with us arrive at full age, and after eight years old, it is unuſual to ſee a perfectly ſound horſe; yet horſes do not work proportionally more than many claſſes of labourers, who arrive to 70 years: nor is the mode of ſhoeing horſes a greater deviation from nature than a Dutchman's or an Iriſhman's wooden clogs; and yet neither are lame at an advanced period; whence then this difference, but that the health of one is overſeen by perſons poſſeſſed of reaſon, guided by ſcience: while that of the other is in the hands of perſons who are poſſeſſed of no ſcience, and ſeldom uſe their reaſon, at leaſt on theſe occaſions.

Farriery has hitherto been conducted by rules and receipts; it is now attempted to be taught by principles and ſcience; but farriers are not willing to be put to the trouble of learning, nor to the mortification of owning they need it; hence they obſtinately maintain nothing is neceſſary but what is known; and that it is a mechanical art, learned by imitation, in common with every other handicraft purſuit.

But farriers ſhould be aware, there is no mortification in candidly pleading ignorance, on the contrary, ingenuouſneſs would enoble them. Nor ſhould this uſeful body of perſons haſtily conclude that thoſe who teach the reformed practice, are at war with their perſons, or wiſh to leſſen their employment; on the contrary, they combat only the errors received into the art, and point out the means by which the farriers themſelves may correct them, and hence, by becoming more ſucceſsful practitioners, they would accumulate more buſineſs and conſequent emolument. Farriers are a moſt uſeful body of men; they riſk their lives in the ſervice of mankind, in their uſual occupations; and many among them I have met with who were ſenſible, intelligent, and the firſt to own the little real knowledge amongſt them, with regard to their art. A very ſtrong inſtance of this exiſts in a worthy and ingenious member of this body, reſiding at a ſmall town in Suſſex (Ticehurſt). This perſon, originally ignorant, and without knowledge in his profeſſion, but with excellent natural abilities, applied himſelf to amend the errors of his education; which he did ſo effectually as in many inſtances to become the penman and dictator of his town: by this enlargement of his mind he became ſenſible of his deficiency in common with the reſt of his brethren of the art he profeſſed, and by beginning to ſtudy it from the foundation, in gaining an acquaintance with the ſtructure of the animal body, proceeding to the functions and œconomy, and comparing theſe under health and diſeaſe; from what I have deſcribed him he has become an ornament to the profeſſion and a moſt excellent practitioner; and it muſt be remarked, the ſame attainments are in every ones reach. He was ſhut up in a ſmall town ſurrounded with bad roads, and had a wife with ſeven or eight children, with, at that time only a moderate buſineſs and no other reſources: theſe appear unfavourable circumſtances for a man to purſue information; yet indefatigable attention will conquer every obſtacle; he became firſt well informed, and then entered at the veterinary college, where his ardour for improvement has been ſuch, that he has rode from his reſidence for a ſingle lecture, and in no inſtance was ever in London, I believe, for more than twenty-four hours at a time. I have dwelt upon this ingenious perſon's attainments, becauſe I wiſh to ſtimulate others to ſimilar exertions, when they may expect ſimilar reſults; the confidence of all their employers, with an encreaſing buſineſs. I by no means deſpair of yet ſeeing this uſeful claſs of men open their eyes on their own defects, and to which, I think, they ſhould be drawn by every conciliatory means in the power of thoſe veterinarians from whom inſtruction may be expected to be derived. In the firſt place, it ſhould be pointed out, that there is no honorary diſtinction between the *veterinarian* and *farrier:* the terms ſhould be well explained; *farriery* is a branch of veterinary medicine only; *veterinarian* is not an aſſumed term ſimply, it is a definite appellation, to which the farrier has an equal right, if he profeſſes and underſtands the diſeaſes of animals, that though the veterinary college holds out the means of attaining this art by ſcientific progreſſion, yet the ſame means they purſue, are in the reach of other perſons; they profeſs no ſecret arts, the book of nature is equally open to the meaneſt farrier, if he purſues inveſtigation upon equally excellent principles. That the different ranks theſe two claſſes of profeſſional men appear to bear, is only ariſing from the different modes they have taken to arrive at the ſame point, and the different degrees of progreſs they may be ſuppoſed to have made by theſe variations in purſuit; and thence he who is eminent in the ſtable, will be received into the parlour, while he who contents himſelf with the attainments of a groom, can only expect to be eminent among grooms; and he who only deſires to excel in the alehouſe, cannot be ſurpriſed that others excel him in his art, and exceed him in employ; and that while he is drudging on unknowing and unknown, they are arriving at riches and fame. I have ſaid there are farriers who are ſenſible, intelligent, and unaſſuming men, conſcious of their own defects; I have met with many inſtances of them; but there are many of a contrary caſt, ignorant, aſſuming and obſtinate; theſe pertinaciouſly hold out againſt improvement and virulently contend, that the ſyſtem as at preſent practiſed cannot be mended, though their practice itſelf proves fatal in three out of five acute caſes, and ends in permanent unſoundneſs in four out of ſeven chronic or local ones. Theſe perſons look on every attempt at improvement as an unjuſt innovation on their right, and on every expoſure of error, as an attack upon their perſons.

This has given occaſion to a moſt illiberal attack on the Veterinary College in general, and on the Profeſſor in particular, by a perſon who appears to have very good natural abilities, but without cultivation.

tivation. He is himſelf the ſtrongeſt poſſible inſtance of what he attempts to deny, that the preſent practice of farriery is grounded in ignorance, and wants improvement. The perſon I allude to, is Mr. Lane, a farrier, who has publiſhed a Vindication of Engliſh Farriery. To ſupport this, Mr. Lane has brought forward a pamphlet filled with *erroneous aſſertions*, *ignorant combinations* and *falſe concluſions*; had this perſon confined his attack to the perſon or conduct of Mr. Coleman alone, it would not have been my province to have animadverted upon it; that gentleman's abilities are too well known to need any defence of mine; but as he attacks the art indiſcriminately, as aiming at improvement, and there are perſons fooliſh enough to be miſled; ſo it would be a tacit ſubmiſſion, and a ſecret avowal of his opprobium, was it to paſs unnoticed in a work expreſsly dedicated to teaching the art fundamentally; but let me here again repeat, I have no hoſtile intention againſt Mr. L. as a man, I only wiſh to ſhew, that upon no principle can ignorance or error be vindicated; and that all ſuch attempts, ſerve only more ſtrongly to point out the neceſſity of improvement. It ſeems to me impoſſible, that any perſon profeſſing this art ſhould ſeriouſly caſt even a ſlight upon the very groundwork whereon it is built, and its very vitals whereby it is fed; and yet Mr. Lane is the author of the quotation I have lately introduced. Moſt of the queſtions Mr. Lane aſks with regard to the utility of anatomy, *Preface*, p. 5, may, unfortunately for his poſition, be anſwered fully in the affirmative. Anatomy to thoſe who underſtand it radically, does teach the cauſe of moon blindneſs, and anatomy alone can teach it; and it is to this very knowledge, that Mr. Coleman has gone farther towards the true knowledge of diſeaſes of the eyes, than perhaps any other perſon in the world; it is from accurate inveſtigations into the ſtructure of this organ, as well under diſeaſe, as in health, that we have been enabled to ſimplify this part of the art; and inſtead of a long liſt of diſeaſes, we now reduce them to two only; inflammation and palſy.

Though the organization of parts does not appear immediately deranged in fever, yet it is to anatomy which teaches the laws of the animal œconomy we are indebted for our knowledge, that fever is a peculiar affection of the blood and blood-veſſels, in which there appears to be a loſs of that healthy harmony between living blood and living veſſels.

By diſſections of morbid ſubjects, we can accurately aſcertain what affection the lungs have undergone, and by this very anatomy it is, that inſtead of treating horſes with cordial balls, and comforting drinks, whereby the inflammation certainly ended in gangrene, and then "*the horſe died rotten, rotten as* "*a pear, and had long been unſound*;" inſtead of ſuch a deſtructive practice which has been in common uſe, we know that a horſe, under ſuch circumſtances, is no otherwiſe unſound than as being at the moment unfit for labour, nor as no otherwiſe rotten than as our ill-management may make him ſo. We therefore now give no cordials, but we bleed and bliſter profuſely; and if we are luckily employed alone or in concert with an intelligent and unaſſuming farrier, we certainly ſave our patient; but if cordials have been given, we never venture to anſwer for the effect. To purſue the matter further; it is anatomy that has taught us what thick wind and what broken wind are, which, till this noble ſtudy was encouraged, was not even hinted at, except in terms or ideas too vague to need refuting; ſuch as the rupture of the phrenic nerve or a paralyſis of it, either of which would immediately ſuffocate.

Anatomy has taught the principal ſeat of glanders to La Foſſe, beyond the poſſibility of doubt; ſubſequent inveſtigations have thrown great light on its cauſe. The different diſeaſes of the bowels are all not only illuſtrated by morbid anatomy, but we have thereby been enabled to make a true diſtinction between inflammatory and flatulent cholic, a diſtinction of the higheſt importance: this has likewiſe led to the detection of the fatal practice in uſe among farriers, of giving gin, oil of juniper, &c. when inflammation is the cauſe. It is by anatomy we know that molten greaſe is no ſtirring up or melting of the fat of the body, which has been a moſt groſs and dangerous error of long ſtanding; but that it is ſimply a throwing out of coagulable lymph,

lymph; or the white parts of the blood on the ſurface of the inteſtines, in conſequence of inflammation; and hence our treatment is now judicious and beneficial. It has taught us likewiſe, that ſtrong phyſic is dangerous, becauſe what was miſtaken for fat, is only the effect of inflammation. Theſe therefore are *falſe inferences* of Mr. L. I have read Sollyſell, De Saunier, and La Foſſe, but I never yet found Mr. Coleman's reaſoning in either of them; when Mr. L. therefore ſays of Mr. C. that what he practiſes and what he has written is copied verbatim from them, I regard it as an *erroneous aſſertion*. It is uſual in theſe caſes to give appoſite quotations to juſtify aſſertions.

Mr. L. then proceeds to deſcant on Mr. Taplin's productions, on his pretenſions, and on his qualifications. Without any improper meaning, this, I conceive, is an *ignorant combination.* Our author then again leaves Mr. Taplin and commences his attack upon Mr. Coleman and his principles of ſhoeing, in language, that even if true, is indefenſible. Mr. Coleman, by ſome good judges, is ſuppoſed entitled to a great ſhare of originality in his publication on this ſubject, which is univerſally allowed a work of great merit: it is true, Mr. C. attacks the farriers as a body with great ſeverity, but it was perhaps from a perfect conviction they deſerved it as a body, yet Mr. Coleman, I dare aver, would be one of the firſt to do juſtice to individuals.

Mr. L. proceeds to ſay with his *uſual accuracy*, that Oſmer followed the method of La Foſſe, which he ſays was found to cauſe all the evils it was meant to prevent. Perſons who ſet up a defence for others, ſhould be very correct in their aſſertions; for if they are found groſsly defective in one inſtance, they may fairly be ſuſpected to be ſo in others. Mr. L. muſt have very haſtily read his authorities, or perhaps he only truſted to recollection. Oſmer was undoubtedly the father of good ſhoeing in this country; with what truth he may be ſaid to have followed La Foſſe's method, we ſhall ſee from the following quotation: "The Sieur La Foſſe to "whom the world is indebted for many excellent "obſervations, has already laid down ſome rules. "And though, I dare ſay, every man who has tried "his method of ſhoeing is convinced of its impro-"priety, I mean as a general method, yet ſome "uſeful hints may be gathered from his doctrine." Oſmer, page 8. third edition. This therefore may be regarded as another *erroneous aſſertion*. The fact is, that the ſhoe recommended by Oſmer, is that in uſe among the more expert blackſmiths at this time, and is that Mr. Lane inſiſts on himſelf.

He proceeds then to defend the cuſtom of putting on the ſhoe hot to the foot; which he ſays relaxes the veſſels, and promotes a larger effluvium from excretory glands. Surely this does not agree with Mr. L's motto: except in the ſandy deſerts of Arabia, the horſe does not meet in a ſtate of nature with theſe means of relaxing his feet, and there we know he is more liable to hard contracted feet than in any other climate.——Our author then informs us, that no profeſſion can boaſt of greater improvements than the farriers of this country have done for ſixty years paſt: yet he notices only one, which undoubtedly was a very great improvement; this was the bar ſhoe; but he ſhould recollect Mr. Coleman adopts this, and every ingenious veterinarian likewiſe. I ſhall not attempt to follow Mr. Lane through all his deſultory remarks, in which he is one moment attacking one mode, and in another, a ſecond method; nor is there any arguing againſt a perſon who virulently attacks a living author in one line, and one who has been dead theſe hundred years in the next. This method is not argument, it is rant; it is not criticiſm, it is invective. It is likewiſe impoſſible to attempt the defence of any ſyſtem that is ſupported by aſſertions the moſt palpably erroneous. Mr. Lane cannot have for many years read the authorities he quotes; he miſtakes them all. Let any perſon conſider what a champion the antient farriery has in a perſon who argues and criticiſes with ſuch acumen as is exhibited in the following inſtance. Mr. L. quoting St. Bel has: "he further ſays, if the farrier when raſping "a foot, ſhould touch ever ſo ſlightly the *origin of* "*the nails* near the coronet, where the parts are "exceedingly thin, ſand cracks are very apt to "enſue, the beginning of which is a ſmall wound

" or crevice occaſioned by the ſtrokes of the raſp." By this origin of the nails, Mr. St. Bel evidently means the beginning of the hoofs at the coronet, and certainly too deep a ſtroke of the raſp there might produce a ſand crack by wounding the vaſular coronary ligament ſecreting the hoof. But our critic apparently unaware that the hoof is frequently compared to the *human nail*, and thinking only of iron nails proceeds, " How ignorant muſt " theſe men be to aſſert, that ſand cracks can pro- " ceed from cuts of the raſp." *Sand cracks never have their origin from the bottom* or ſides of the foot, but *always from the coronet.* Mr. Lane, I preſume, has ere now been fitted with clothes by a tailor who never *made* a ſuit in his life; many hundreds of ſuch are very eminent in London: and are perhaps ſome of the moſt expert at adapting clothing to the various ſhapes they meet with, of any perſons in the world: yet they could not by their own hands probably compleat a flannel jacket. Exactly in the ſame way may Mr. Coleman, or any other perſon, underſtand the œconomy of the foot, and be an excellent inſtructor in the art of ſhoeing without " twelve hours labour " every day for ſeven years," indeed without ever forging a ſhoe. I think I might venture to aſſert, Mr. Morecroft never formed a ſhoe in his life, nor would I truſt him to drive a nail into the foot of an aſs of mine; yet I believe no perſon would doubt the excellence of Mr. Morecroft's judgment on every branch of ſhoeing. With all the great improvements of the farriers, it would have been fortunate had any of them hit on this gentleman's mode of caſting or framing ſhoes. Mr. Morecroft is peculiarly fortunate in eſcaping any of Mr. L's ire, though his ſhoes have not eſcaped animadverſion. This circumſtance has been wondered at, as Mr. Morecroft is a regular veterinarian, but the reaſon may be found in his ingenious treatiſe on ſhoeing; where page 19, he introduces a conciliatory note, and with which I perfectly agree; there are ſeveral and many farriers in this kingdom poſſeſſed of great practical information.

Mr. Lane ſupports the erroneous opinion of farriers, with regard to cheſt founder, which he ſays is a natural diſeaſe. He may reſt aſſured that what is called a cheſt foundered horſe, is as free from complaint in his cheſt as himſelf; and this is one of the great improvements the noble art of anatomy has taught: and that a diſeaſe originating in, and confining its effects to the feet, ſhould hitherto be miſtaken for a diſeaſe of the cheſt, is a proof that the "ſuperiority of Engliſh farriery," is not ſo great as our author endeavours to ſhew.——Though it is indeed a proof he is himſelf convinced of this ſuperiority he is contending for "when he de-"clares to his country and the world, that it is im-"poſſible for a farrier by any method of ſhoeing to "contract the feet." I really think this is the moſt peculiar aſſertion I ever met with, and if true, Solleyſel, Berenger, De Saunier, Newcaſtle, Gibſon, La Foſſe, Bracken, Bourgelat, Lord Pembroke, Clarke, Oſmer, St. Bel, Coleman, and Morecroft, muſt be dupes or impoſtors. The matter is at iſſue between all theſe eminent characters, and an individual; it is not, I think, difficult to decide between them.

If it wanted any further proof that Mr. Lane had not ſucceeded in his attempts at proving the "ſu-" periority of Engliſh farriery," as at preſent practiſed among the generality of farriers, I think his remarks and obſervations on Mr. Coleman's inſtructions to army veterinary ſurgeons, would ſufficiently prove it. I conſider that Mr. Lane, as a very old farrier, ſpeaks the language of the whole body, and of farriery as uſually practiſed; and it is to this general language and practice I reply. This being conſidered, I can, I think, eaſily prove that this very publication, as ſpeaking the general language, and as expoſing the general uſage, is the ſtrongeſt condemnation of Engliſh farriery; it ſhews it groſsly ignorant of the ſtructure of the body, of the functions of its parts, the general laws of the animal œconomy, and the neceſſary diſtinctions between health and diſeaſe. It ſhews that ſo far from evincing a ſuperiority, that it is founded in ignorance; having no other parent than cuſtom, taught only mechanically, and learned only by imitation: it proceeds by rules, but has no principles. Hence there is a neceſſity for a reform, for a means of teaching the art from a foundation, and giving principles to its practitioners: and hence the attempts at improvement are founded in humanity, and intended as a national good; and not "to aim "a deadly blow at one of the moſt uſeful bodies "in the kingdom, and by ruining their characters, "baſely to ſupplant them in the art." Mr. Lane ridicules Mr. Coleman's attempting a diſtinction between inflammatory and flatulent cholic. It is from the want of knowledge ſufficient to make theſe diſtinctions, that ſo many horſes are killed by ſome ignorant perſons, and if farriers do not know that a pulſe leſs hard than in inflammation, and the horſe rolling on his back, are ſtrong characteriſtic marks of gripes, it is not becauſe they are not ſo, but becauſe their information does not reach thus far: therefore, their *ſuperiority* is not very manifeſt. In the treatment of gripes, Mr. C. cannot prove himſelf ignorant of the cauſe, when he has not even attempted it, and with regard to the quantity of blood taken, he was not to ſuppoſe the perſons he addreſſed himſelf to, ſo ignorant as to require a ſcale of pints for hands, or ounces for inches.

It is to Mr. Lane's ignorance of the law in the œconomy, that two diſtinct inflammations ſeldom exiſt in the neighbourhood of each other; that he wonders Mr. C. directs rowels and a hot iron. Rowels excite inflammation, and if the leather is ſmeared with bliſtering ointment they do it immediately; hence by making an inflammation on the ſurface, that within occaſioning the diſeaſe is leſſened. It is by the ſame means the iron acts; and as Mr. Coleman conſidered he was addreſſing himſelf to thoſe to whom he had before taught theſe laws, it was unneceſſary to point out the part the iron ſhould be applied to. He was aware their *principles* would direct them, that it ſhould be as near the affected part as poſſible; and here again is another proof of what I wiſh to eſtabliſh, the ſuperiority of teaching the art on ſcientific principles, by which men are taught as well to think, as act. Gibſon, Bartlet, and others wrote to teach the mode of curing diſeaſes, and not the principles of the healing art, of which they were in many inſtances themſelves unacquainted: ſo when they laid down rules for treatment, they would be mechanical; and knowing the want of information in farriers, they would deſcribe the form of the iron, the depth it was to be applied, the extent, the exact part, the degree of heat, the duration, &c. in fact it muſt be done by rule and form, or ſome miſtake would occur; for they were teaching the practice, not the principles. But in our preſent mode we teach the principles, and the practice ſprings out of theſe. Common farriers, therefore, always condemn what they do not underſtand. Mr. Lane ſuppoſes that ſtaggers is nervous and occaſioned by impoveriſhed blood, and that bleeding is uſeleſs. Mr. L. could never have ſeen a horſe in mad ſtaggers. Nor could he have ever witneſſed the good effects of taking five, ſix, or even ſeven quarts of blood from a horſe in this diſeaſe, which there is hardly any farrier but himſelf but has ſeen. He, is as indeed moſt farriers are, ignorant of that ſpecies of ſtaggers that ariſes from too eager eating. In farcy, we find another of our author's *erroneous aſſertions*, and which leads him to *falſe concluſions*. Sollyſel could never have been Mr. Coleman's guide, for the one deſcribes the ſeat of the diſeaſe in the veins, the other in the abſorbents. Mr. Lane then brings aſſertion without proof, as indeed almoſt all his aſſertions are, when he ſays, that farcy never terminates in glanders, nor glanders in farcy. At the veterinary college, farcy has produced glanders, and there likewiſe, glanders has produced farcy.

Mr. Lane concludes " rhubarb and jalap have no " tendency to purge a horſe. The effects of medi" cines on men and horſes have no analogy. What " light then can the lectures of the moſt eminent " phyſicians throw on farriery ?" It is by the general laws of the animal œconomy taught by eminent phyſicians, applied and brought to experimental enquiry upon the animal in queſtion, that we are aware that the ſubſtances he ſpeaks of, with many others, have not a correſpondent effect on the horſe, as on man. I ſhall conclude my remarks on this publication, becauſe I hope to afford ample proofs throughout this work, that Engliſh farriery is in a wretched ſtate; that it hence needs amendment; that this amendment can only be brought about by teaching the art fundamentally;

tally; and that as anatomy is the baſe of every branch of the healing art, ſo anatomy is eſſentially neceſſary to a proper acquaintance with it. As anatomy with the practical branches of the art are taught at the veterinary college, ſo it is evident that this muſt be a moſt valuable inſtitution, which every one ſhould if poſſible avail themſelves of: that as there are perſons who may wiſh to ſtudy this art upon proper principles, who are not able to attend there, and as the helps to ſuch an undertaking are few and nearly uſeleſs, ſo it is evident a work formed on this mode of teaching the art is much wanted; and it is hoped the preſent performance will anſwer this deſirable purpoſe, to which end I have began by thus ſhewing the importance and neceſſity of this branch of knowledge, and I have endeavoured to anſwer thoſe who contend no ſuch improvement is wanted. I know to ſenſible and intelligent minds, ſuch a performance as that I have been ſpeaking of was its own anſwer, and that it was giving it conſequence to notice it. As a work of individual abuſe, I ſhould never have attempted it, but as its errors are ſo appoſite, and ſerve to illuſtrate my preſent ſubject ſo aptly, I could not paſs it over: add to which, to a ſuperficial obſerver who only reads on one ſide of a queſtion, Mr. Lane might have ſome weight in throwing the art as at preſent taught into diſrepute, which perhaps may in ſome meaſure be leſſened by the preſent remarks, which is the only end I have in view in making them.

It is unneceſſary for me to enter into any farther detail of the improvements that the veterinary college has already brought about in the art; they may be gained from the above criticiſm, and will occaſionally be more fully deſcribed as far as I am acquainted with them, in the courſe of the work.

SECTION IV.

Of the proper Means for the Attainment of the Veterinary Art.

I HAD intended to treat on this ſubject at ſome length, but I have ſince thought it moſt proper to curtail ſome of my ideas, and to incorporate others in the body of my work. The mode in which any art is attained muſt be in a great meaſure directed by the future views of the learners. It appears to me, that there are three diſtinct claſſes of perſons who are likely to ſtudy this branch of uſeful knowledge. The firſt are perſons of fortune with enlarged minds and extended educations. The ſecond are ſurgeons, whoſe ſituation in country villages may render their ſervices in this art highly uſeful, upon occaſions when no farrier is at hand, or in the end, in caſes in which farriers of the common claſs are unable to judge. The third are farriers themſelves, or perſons intending to profeſs veterinary medicine.

Gentlemen and amateurs who wiſh to accumulate information on this curious and intereſting ſubject, within the reach of the veterinary college, will find their account in attending a courſe of lectures there; if not, they ſhould apply themſelves to the ſtudy of the more general parts of the body, both of the human and animal; the latter I hope they may gain by the following ſheets. They may direct the collar-maker, huntſman, or tanner to cut up their dead horſes in their preſence. They may ſtudy phyſiology in a pleaſant and intereſting manner, from the ingenious work on this ſubject by Mr. Saumarez. The lighter parts of the veterinary art may be acquired with pleaſure, from the elegant publication of Mr. Richard Lawrence of Birmingham: and a courſe of chemiſtry will amply reward them for their pains in acquiring it.

A good ſurgeon has travelled three fourths of the road towards making a good veterinarian, but he muſt diligently travel the remainder to arrive at excellence. He muſt by no means ſit down contented with the analogy between the human and brute; which, if he does, will lead him into very great error; for though this analogy is in moſt caſes very ſtriking, yet there are others in which the ſimilarity fails, and he is left to act upon other principles. Hence in thoſe diſeaſes that are conquered or mitigated by vomiting in the human, in the horſe he muſt purſue another mode of treatment. In acute diſeaſes removed by purging in the human, his attempts in the horſe would probably fail; as before the effects were produced, the animal might be paſt relief. It muſt be remembered that the operations of medicines are very different in the one and the other. It is not ſufficient that a ſurgeon has an intimate acquaintance with the human frame, he muſt be equally converſant with the animal he treats, or he will treat in vain; particularly thoſe diſeaſes originating in a peculiarity of form from the human, as all the diſeaſes of the feet. He ſhould make himſelf particularly converſant with the ſpecific diſeaſes of the horſe, which bear no analogy to any thing in the human body: as farcy, glanders, ſtrangles, greaſe, &c. The great ſtrength of the arterial ſyſtem muſt ever be preſent to his imagination, by which he will be aware how prone the diſeaſes of the horſe are to a rapid termination; and hence that his treatment muſt be deciſive and energetic: therefore in all caſes he muſt be very attentive to diagnoſtics. But what will much embarraſs a ſurgeon in practiſing the veterinary art, will be a want of knowledge of the general uſages, nomenclature, and idiom, if I may ſo expreſs it, among grooms and farriers; without an acquaintance with which, theſe people at once detect and deſpiſe the practitioner. It ſhould be the buſineſs therefore of the ſurgeon, with his other acquiſitions, to learn theſe manners, and make himſelf acquainted with their terms.

The third claſs of perſons, either farriers already practiſing, or perſons intending to practiſe, will eaſily gain, that when it is in their power, I would adviſe their taking the advantage of the veterinary college; but when they cannot, I would recommend the proſecution of their ſtudies in a regular manner. Begin by firſt reading ſome general deſcription of the human body, ſuch as Symonds's anatomy, or the anatomical part of the preſent work; carefully let them pay attention to the functions and uſes of parts, particularly where the ſame uſes are brought about by a variation in ſtructure; this enlarges the mind, and prepares it to receive the benefits of diſſection, which ſhould now be proceeded to: any ſmall animal may be firſt diſſected, to enable the learner to uſe his inſtruments properly. He may then proceed to diſſect the horſe with ſome authorities by him, which will aſſiſt him at firſt to make out parts, but too ſcrupulous an attention to numerous deſcriptions will only bewilder. The neceſſary inſtructions for diſſection and the preſervation of parts, may be gained by a recourſe to Poole's Anatomical Inſtructor, which is profeſſedly written to inſtruct the pupil in theſe particulars. When he is well acquainted with the appearances of the animal in health, he ſhould take every opportunity of examining diſeaſed appearances, which are ſeldom wanting at the tan-yard or the kennel. He ſhould now make himſelf acquainted more intimately with phyſiology, for which purpoſe he may read Haller's works and the ingenious publication of Mr. Saumarez: there is at preſent a tranſlation making of Cuvier's Treatiſe on Comparative Anatomy, which he may likewiſe avail himſelf of. And his whole purſuit may be aſſiſted by a reference to Parkinſon's Pupil's Guide. When he has become acquainted with pathology as at preſent received, he may peruſe all the older authors in farriery; to this ſhould ſucceed a knowledge in chemiſtry, preceded by an acquaintance with the materia medica; the proper works for which he may ſee by a reference to that article, and nothing will now be wanting but experience and practice to perfect him. I have thus given the mere outlines of a proper courſe of ſtudy; more is not at preſent neceſſary, as an attention to this work will, I hope, prove in itſelf the firſt ſtep to a ſucceſsful practice, and a general acquaintance with the art; and in its proſecution the road to farther improvement will be pointed out.

SECTION V.

Of Chemiſtry.

EVERY body cognizable to our ſenſes is compoſed of matter. *Matter* is moſt extenſive ; it every where commands our attention. Animal bodies are compoſed in common with every thing around us, of matter, conſequently the nature, properties, and diviſion of this univerſal ſubſtance, become neceſſary to form the ground-work of our plan. *Matter* exiſts under various modifications, and it puts on many forms entirely diſſimilar, yet all its varieties of configuration and exiſtence, may be divided into animal, vegetable, and mineral ; and to one or the other of theſe, every thing we meet with may be referred. But to ſuit our preſent purpoſe, we have a more ſimple diviſion of all matter into *living*, and *dead*. Animals and vegetables both belong to the former, for they are both organized, they both have a living principle, and both renew themſelves by propagation. Mineral or common matter, owes probably its formation to the attraction of its particles to each other. We ſhall begin with this laſt, as leading to one of the collateral branches we propoſe mentioning.

Common or *mineral* matter is naturally paſſive and quieſcent, acting only when acted on by ſome other body, and by ſome foreign power; its motions are therefore mechanical, and the knowledge of theſe motions have from hence been termed *mechanics.*

Mechanics teach the various important changes brought about on bodies, by the application of ſome foreign power; thus is explained gravitation, the actions of the ſcrew, wedge, lever, pulley, &c. which it is the province of philoſophy to teach, but which are very neceſſary for the veterinarian to know.

When one body acts on another, and an intimate union takes place between them, and their ſeveral qualities are changed or loſt; this is termed a chemical union, and the ſcience that explains theſe phenomena is called *chemiſtry.* "Chemiſtry is the "ſcience which diſcovers the conſtituent principles "of bodies, the reſults of their various combina-"tions, and the laws by which theſe combinations "are effected."

Chemiſtry is a ſcience of ſuch univerſal importance, that there is hardly a profeſſion to which it is not neceſſary, nor hardly a perſon to whom its acquaintance is not uſeful. It has a moſt intimate connection with moſt other ſciences, and in the uſeful and profitable arts, its ſervices have been very eminent. But to the medical practitioner, chemiſtry is an indiſpenſible branch of knowledge, and is rendered now more abſolutely neceſſary from the immenſe number of chemical combinations we form in our remedies; from the uſe we make of gaſeous bodies; and more particularly from the univerſal reception a chemical theory has gained, ſince the ſcience has become more ſimple and definite. I cannot too ſtrongly impreſs the ſtudent's mind with the utility of this branch of knowledge, nor how much at a loſs he will feel himſelf upon many occaſions without it: indeed a want of it renders our practice not only in many inſtances inert, but even dangerous. Some ſubſtances, when mixed, poſſeſs properties utterly diſſimilar to what they poſſeſſed in a ſeparate ſtate; hence we might deſtroy not only the effect we intended to produce, but bring about others totally contrary to our intentions. *Emetic tartar* taken into the human ſtomach, is ſaid greatly to loſe its emetic qualities by an admixture with bark; hence it has been hinted that bark might prove an antidote to emetic tartar when taken in deleterious quantities. The Indians uſe *caſſada*, one of the ſtrongeſt poiſons, as a beverage; but experience has taught them that its noxious properties are loſt by a mixture of cayenne pepper.

The immediate uſe of this ſcience in pharmacy muſt therefore be ſelf-evident; without ſome acquaintance with it, it is impoſſible even to compound medicines with propriety: the practitioner might find himſelf frequently foiled in mixing a compound, which often happens from a want of combination in the ſubſtances intended to be mixed.

From chemiſtry have ſprung ſome of the moſt valuable diſcoveries as well to arts and manufactures, as to the ſcience of medicine. The art of bleaching by means of the oxygenated muriatic acid, is one proof of the acquiſitions that have been gained by it. It was to an intimate knowledge of the various combinations that take place in bodies, that the learned Dr. Macbride made his moſt uſeful diſcovery in tanning; a proceſs of the utmoſt importance in the manufacturing of leather. By the ſimple addition of lime to the *ooze*, or making the *ooze* of lime water, nearly half the time is ſaved in this tedious proceſs, and conſequently an immenſe expence. Hence it is that infuſions of Peruvian bark have been long directed to be made in lime water, by which more of the ſtrength of the bark is ſuppoſed to be extracted.——Its various other improvements in arts and manufactures have been too numerous and rapid to particularize. In medicine it has been no leſs an auxiliary. From the late diſcoveries and additions to this ſcience, Dr. Rollo was led to form his ingenious theory of the nature and cauſe of diabetes, by which we are enabled to ground a mode of cure for a diſeaſe hitherto uſually fatal *. By a more intimate acquaintance with chemical facts, we are enabled to account for many of the animal functions hitherto inexplicable, and the immediate uſe of parts becomes more evident by this means. The body is ſuppoſed to abound with azote, much of which is detected in the urine; thus the kidneys are ſuppoſed to be the immediate means by which this principle is carried off. By this we are enabled to ſolve the difficulty that has for ages exiſted in conſidering the true uſe of the lungs, which now appears to be to ſeparate from the conſtitution the ſuperabundant quantity of carbon. Suſpended animation has had great lights thrown on it by the ſame ſources, by which means thouſands of our fellow creatures have been called back to life, repentance, and happineſs. Connected with theſe functions, are the great diſcoveries in pneumatic chemiſtry, which have been applied to medicinal purpoſes with variable ſucceſs, but ſanguine expectations.

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* Diabetes he ſuppoſes to ariſe from a morbid change of the powers of digeſtion and aſſimilation, and from a vitiation of the gaſtric juice, and the formation of a ſaccharine matter in the ſtomach,

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ſtomach, chiefly from vegetable food; the ſkin and lungs not being at all connected with the diſeaſe, and the kidneys only ſecondarily: hence the cure was readily promoted by animal food, with the exhibition of emetics, hepatiſed ammonia, and narcotics.

He grounded this valuable diſcovery on conſidering the diſeaſe as originating in a hyper oxygenated ſtate of the ſtomach; and hence abſtracting oxygen from the ſyſtem, and removing the morbid ſtate of the ſtomach, appear, and have proved a cure for a complaint hitherto fatal.

Conciſe Hiſtory of Chemiſtry.

Chemiſtry is a very antient ſcience. The Egyptians, we know, cultivated it; but in thoſe dark ages, when all phenomena were attributed to magic, it was eagerly caught hold of by the prieſts, who mingled with it, their charms, incantations, and ſorceries; it was thus made a ſyſtem of gain to the profeſſors, but gained nothing to itſelf. From the great phenomena diſplayed by this ſcience, and by the wonderful changes produced on bodies by its means, it early gave riſe to an opinion that it contained the property of contributing to all our wants, by a power of converting every thing into gold, and of giving the means of lengthening out life to a very protracted period; and that theſe valuable ſecrets might, by diligent inveſtigation, be found out: hence aroſe *alchymy*, and the reſearches of thoſe laborious *alchymiſts* who waſted their lives in ſearch of the great art of *tranſmutation*, and the diſcovery of the *pabulum vitæ*. Even in later days men have deceived themſelves and others in ſearching for a grand reſtorative, of which the famous Caglioſtro was a ſtriking inſtance *. It is not to our preſent purpoſe to follow chemiſtry through all its various progreſſions and improvements; it is ſufficient to ſay, that numerous diſcoveries agitated, as they aroſe, not only ſcience, but even whole empires. Paracelſus by a bold uſe of minerals, and an acquaintance with ſome branches of this ſcience, firſt introduced it extenſively into medical uſe; from which it became gradually more and more inveſtigated, and chemical mixtures more and more employed in the cure of diſeaſes; though from their too bold and free uſe it appears many miſchiefs aroſe; for we find that in the fifteenth century antimony was forbid in Paris, and minerals in general condemned *. From this the practitioners in France again truſted to ſimples, and their practice became inert; and to this day it continues ſo in farriery, where a long liſt of herbs are preſcribed for a diſeaſe, that we have learned ſucceſsfully to treat with more active medicines.

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* The elegant and accompliſhed Marquis de Verneuill, an intimate acquaintance of Voltaire, was infected with this mania, and loſt his life in ſome of his experiments in alchymy, by a very terrible exploſion which took place.

In the ſeventeenth century, all the chemical facts were collected, compared, and examined; and from them was formed a theory that was quickly diſſeminated throughout Europe, under the name of the *phlogiſtic theory*; invented by an eminent chemiſt of the name of Becher. The principles of this theory reſted on conſidering *fire* as entering into the compoſition of almoſt all bodies; but that uſually it exiſted in a condenſed fixed ſtate, to which they gave the term *phlogiſton,* derived from the Greek of fire, which diſtinguiſhes it from that ſenſible and free ſtate, when we ſee its effects, or feels its influence. Hence has aroſe the term in medicine, *antiphlogiſtic treatment,* for a cooling plan of treatment.

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* Antimony was firſt uſed as a medicine by the accidental diſcovery of Baſil Valentine, who throwing ſome of it away, his hogs eat it, and became very much purged in conſequence, but to his aſtoniſhment grew afterwards very fat.

Fire or phlogiſton was ſuppoſed a material body, capable of modification from exiſting circumſtances, and was either fixed or latent, or free and evident. In the proceſs of combuſtion or burning, ſome bodies burn away without leaving any reſiduum; ſome principle muſt therefore have eſcaped, this was ſaid to be *phlogiſton.* But it was afterwards found on experiment, that metals under combuſtion, and reduced to a calx, inſtead of looſing their weight, became heavier; and that what was gained, was exactly loſt by the ſurrounding atmoſphere: it was therefore ſelf-evident that here was a principle acquired, and not one loſt; conſequently the phlogiſtic doctrine became overturned; yet it fell ſlowly, it had long been eſtabliſhed, was a favourite doctrine, and grounded in the minds of ſome of the firſt chemiſts any age has produced.

The defects in this ſyſtem were principally brought to light by the great diſcoveries made by Black, Cavendiſh, and Prieſtley. By their experiments it had been proved, that air or its components, entered into the compoſition of moſt bodies, and that under certain proceſſes it was evolved, and under others abſorbed; and hence ſome bodies became lighter, and others heavier under combuſtion *. It was likewiſe diſcovered that ſeveral gaſeous bodies exiſt, and under various forms; that is, that there are ſeveral

kinds

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* A very large quantity of air is evolved from the body of the horſe very ſoon after death, which ſwells him up to that enormous ſize ſeen. It is this evolution of air in the human body, but which does not take place for ſome days after death, that cauſes drowned bodies to float at uncertain periods from their death.

It was from this knowledge of airs, that Dr. Macbride diſcovered that meat became putrid from the eſcape of what was then termed fixed air, and that hence it might be reſtored by placing it in a ſituation where the abſorption of this air might again take place. This becomes a matter of conſiderable importance in culinary preparations. It is uſeful to know that a leg of mutton that is not ſweet, may be rendered ſo by hanging it over beer that is working, bread fermenting, or any effervеſcing mixture. I think this knowledge might be applied to many other uſeful purpoſes: it has lately ſtruck me by this means game, particularly grouſe, might be ſent from any part of the kingdom to London; a circumſtance very unuſual at preſent: it might be done, I think, in the following manner. Take a bladder for each bird; which bird ſhould be well drawn and wiped dry, but not ſtuffed in the cuſtomary manner, put the bird thus prepared into the bladder; then take chalk in powder ſix or eight ounces, vinegar half a pint, pour the vinegar on the chalk by degrees, and as it effervеſces, put over it a funnel reverſed; let the ſmall end enter the bladder, which ſhould be held over, and when the bladder is full of the fixed air, immediately tie it; and proceed with as many as are to be done: if beer is working the funnel may be placed over the bung-hole, and the carbonic acid gas may be collected in the ſame manner.

kinds of airs to which from the properties they diſplayed and the phenomena they produced, they gave the general name of *permanently elaſtic fluids.*

It was from the facts obtained by purſuing this ſtudy that the French chemiſts, particularly the ill-fated, and ever-to-be-lamented Lavoiſier, were led to form that ſplendid and luminous ſyſtem, that has aſtoniſhed all Europe by its ſimplicity, by its accuracy, and by the eaſe with which we now are enabled to account for many circumſtances and appearances hitherto unexplained. This ſyſtem has received altogether a new modification from the old, and an entire new nomenclature; hence thoſe ſtudents who are preparing to ſtudy this ſcience, ſhould be careful not to confuſe their ideas with the old doctrine, or they will have not only to learn, but firſt to unlearn; and thus have double trouble. I hope I have given ſufficient proofs of the utility of this branch of knowledge; and that I have ſtimulated the reader to a diſpoſition to undertake its ſtudy. As there will neceſſarily, in the courſe of this work, many chemical names and terms of the new nomenclature appear, I ſhall juſt give a ſimple and mere outline of the ſcience, and a ſhort explanation of the more general terms met with.

Attraction is a very univerſal power that affects all bodies in the univerſe, but not in the ſame manner, or in the ſame degree; hence it is divided into two kinds. The *attraction of gravitation*, and *chemical attraction*, which is likewiſe termed *affinity*.

The attraction of gravitation, the laws of which are taught by philoſophy, is that power whereby all bodies tend to the centre of gravity; that is, would fall to the centre of the earth, was there nothing to impede their motion. Was it not for this attraction, the water, the earth, rocks, ſtones, and we ourſelves, ſhould for ever be flying off the globe by its rotatory motion.

Chemical attraction or *affinity*, will be found a very univerſal term in this ſcience; and it is eſſentially neceſſary for the ſtudent to underſtand it well. In a general ſenſe, it denotes the continual exiſting diſpoſition to bring principles which are diſunited together; but which diſpoſition only takes place in particles in contact, or nearly ſo; whereas the attraction of gravitation takes place on all bodies, and at any diſtance. There will be found two kinds of affinities, or attractions, generally deſcribed by chemiſts.——I. *The affinity or attraction of aggregation* is the union of the homogeneous particles of bodies; and is of different kinds according to its various degrees of force. 1. The *hard* or *ſolid aggregate*, by which the particles of hard bodies are firmly united, as metals, ſtones, &c. 2. The *pliant* or *ſoft aggregate*, by which bodies leſs ſolid are united to their integrant parts, as wax, tar, &c. 3. The *fluid aggregate*; thus two drops of water unite to form one, wherein the ſphere is encreaſed, but the nature remains the ſame. The *æriform* or *gaſeous aggregate*, in which the attraction of coheſion is very ſmall, as in air, vapour, &c.

II. *The affinity or attraction of compoſition*, is that by which the heterogeneous particles of bodies are united; or the attraction, by virtue of which bodies of different natures are uniting to form new combinations. Theſe different diſpoſitions are termed the *affinities*; and from the phenomena diſplayed by theſe, ariſe the terms *ſingle elective attraction*, and *double elective attraction.*

Air is a very univerſal ſubſtance, and does not exiſt, according to vulgar perception, in the atmoſphere only, but enters into the compoſition of moſt bodies, and exiſts in various forms, and is of various kinds; hence the knowledge of the *gaſes* or *airs*, forms a very important and intereſting part of chemiſtry.

Gas is a term for any elaſtic aeriform fluid, hence the different kinds of air have gained the term of *gaſes*. *Gas* or *gaz* is defined to be a compound body, formed by the union of a baſis more or leſs ſolid, with caloric or the matter of heat. But though all gaſes have the appearance of air, they have not all its properties, and this has given riſe to thoſe numerous experiments that have lately taken place in pneumatic chemiſtry.

Atmoſpheric air, or the common air we breathe, is the moſt important and univerſal of the elaſtic fluids we are ſpeaking of; it every where ſurrounds us, and forms one of the greateſt means of our ſupport, being eſſentially neceſſary to our exiſtence. The air in the atmoſphere is ſeldom in a ſtate of abſolute purity, it is commonly mixed with other gaſeous bodies; water in a ſtate of ſolution, with infinitely ſmall particles of matter floating in it; but when it can be obtained pure, it is found compoſed of two gaſes, in different proportions, which are *oxygen gas*, and *nitrogen gas*. Others to this analyſis, add carbonic acid gas; but the invariable exiſtence is doubted, and the proportion ſo ſmall, that it is not conſidered as a neceſſary or conſtant component. By this mixture of vital and azotic air, a beneficial modification is produced: were we to breathe the former unmixed, life would be too ſpeedily conſumed, and the latter is unfit for any of the purpoſes of ſupport. Not only as the air has its component parts in due proportion, but as it is free from other gaſes, does its healthy qualities depend. From the exiſtence of one or both theſe cauſes it is always contaminated in cities, crowded aſſemblies, and cloſe ſtables. Air is permanently elaſtic, has gravity*, and is ſoluble in water; it is farther diſtinguiſhed by two permanent and remarkable qualities, which are the power of ſupporting *reſpiration* and *combuſtion*. That quality by which reſpiration is ſupported, we ſhall ſpeak of in deſcribing that function of the animal œconomy. *Combuſtion* or the act of burning, cannot take place without the preſence of atmoſpheric air; hence in vaults and dungeons the lights are obſcured and burn blue, which has given riſe by connecting the ideas of dim or blue light with ſubterraneous paſſages, to the popular prejudice, that when theſe appearances take place in the lights, ſome inviſible ſpirits are approaching. Combuſtion becomes itſelf the analyſis of air, and proves its component parts *; for

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* The barometer is only an inſtrument that marks the variations in this gravity in the air, and is formed of a tube containing exactly twenty-eight inches of quickſilver, which is a counterpoiſe to the column of atmoſpheric air. This tube being open at the lower end, and having a vacuum above, the mercury riſes and falls as the air becomes heavier or lighter; and hence as theſe two ſtates are uſually connected with dry or moiſt weather, barometers

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meters are called weather glaſſes. The riſing of water in pumps is upon the ſame principle. The weight of the air equals the reſiſtance of thirty-two feet of water; that is, when a pipe of which a pump is to be formed is emptied of its air, the water will riſe in its ſpace exactly thirty-two feet. The quantity of water contained in the atmoſphere is likewiſe meaſured by inſtruments called hygrometers, which are formed of ſubſtances that ſhrink by dryneſs, or ſwell by moiſture; this gives riſe likewiſe to various ſpecies of weather monitors, as ſmall houſes with the figures influenced by catgut, ſea-weed, leather, and numerous other bodies.

* *Analyſis* and *Syntheſis* are terms frequently met with in chemiſtry. Analyſis is the decompoſing or ſeparating the parts of which a body is formed; and when the component parts of any compound are manifeſted in a ſeparate ſtate, it is ſaid to be analyzed: Syntheſis is the compounding or uniting the ſeveral parts of which a body is formed, and when a new product is the reſult, it is called compoſition by ſyntheſis.

this proceſs will only go on in a given quantity of atmoſpheric air, after which the reſidue becomes equally unfit for the ſupport of combuſtion and of reſpiration. Thus, that air that a candle or flame will burn in, an animal may likewiſe breathe, and ſupport life with; but when air is rendered unfit to ſupport flame, it is likewiſe unfit to ſupport life; hence a candle is firſt let down into a long cloſed well, cellar, or pit; if it is found to burn, perſons know they may deſcend; but if on the contrary, it is found to be extinguiſhed, the conſequences would be fatal. Every one muſt have remarked how dim the lights frequently burn in ſtables; whenever this takes place it ought to convince the owner that the ſtable is unhealthy and not ſufficiently ventilated. The proportion of the parts capable of ſupporting combuſtion and reſpiration, is found to be twenty-ſeven in a hundred; hence the air is formed of twenty-ſeven parts of a gas, fitted for the purpoſes we have mentioned, called *oxygen gas*, *vital air*, *dephlogiſticated air*, &c. and of ſeventy-three parts of a gaſeous body unfit for theſe proceſſes, which is called *nitrogen gas*, *azot*, *phlogiſticated air*, *mephitic air*, *moffette*, *&c.*

A body burning, therefore abſorbs the baſe of atmoſpheric air, the oxygen, by which its own weight becomes augmented and its nature altered; it was this encreaſe in weight, diſcovered to have taken place in bodies having undergone the proceſs of combuſtion, that overturned the long eſtabliſhed phlogiſtic theory. Many bodies ſo burned are rendered acid, from whence the baſe of atmoſpheric air has gained the term oxygen or acidifying principle.

Acids are bodies whoſe phenomena are not perfectly known, but they generally are ſuppoſed to be the product of oxygen, with ſome other ſubſtance in combination. Theſe other ſubſtances are termed the baſes or radicals; thus carbonic acid is formed of carbon and oxygen. When the baſis of an acid is perfectly ſaturated with oxygen, the acid is then ſaid to be perfect: but when the baſis predominates, the acid is then ſaid to be imperfect. In the former caſe the ſubſtance is diſtinguiſhed by the Latin ſyllables *icum* or the Engliſh *ic*; thus the perfect acid of nitre is called *acidum nitricum* or nitric acid; but when it is imperfect, it ends in Latin, in *oſum*, and in Engliſh by *ous*, as *acidum nitroſum* or nitrous acid. When an exceſs of oxygen prevails, the ſubſtance is ſaid to be *oxygenated,* and when this exceſs is very great, it is ſaid to be *ſuper-oxygenated.* Metals and ſome other ſubſtances expoſed to the action of oxygen, have the acidifying principle take place without the properties of the acid becoming evident; the produce is not then called an acid, but an *oxyd* or *oxide*; thus iron expoſed to air or water attracts the oxygen, and ruſt is formed, which is the oxyd of iron. *Oxyd* or *oxide* is now employed for what uſed to be termed *metallic calces.* *Acids* are hence very numerous, but thoſe employed medicinally are the acetic, acetous, benzoic, carbonic, citric, muriatic, nitric, nitrous, and ſulphuric; and there is reaſon to believe under all their varieties, they poſſeſs ſome principle in common.

Oxygen gas, therefore is one of the component parts of atmoſpheric air, and is ſaid to be oxygen combined with caloric, and forms that part by which combuſtion and reſpiration are ſupported, it forms likewiſe acids, and hence receives its name. As the air contains more or leſs of this gas, it is ſaid to be more or leſs pure, and conſequently more or leſs wholeſome. Oxygen itſelf enters into moſt bodies, and its agency in the operations of nature is almoſt univerſal. It is extracted and procured from ſeveral bodies during their decompoſition, and as this air has been medicinally uſed, mixed in various proportions with atmoſpheric air; the knowledge of theſe ſubſtances, and the modes employed to procure it, have been lately much cultivated.

Nitrogen gas has ſeveral ſynonyms, as *azot*, *phlogiſticated air*, *mephitic air*, *&c.* and appears to be formed of nitrogen and caloric, and is the remaining part of atmoſpheric air after the oxygen has been abſorbed. It exiſts in moſt bodies in the animal and vegetable kingdoms, and is obtained freely from the fibrous parts of animals, and from nitre. It is exceſſively deleterious and deſtructive to the life of animals. Nitrogen is the nitric radical or baſe of the nitric acid, before termed aqua fortis.

Hydrogen gas receives its name from being one of the conſtituents of water, of which oxygen is the other, and is formed of hydrogen united with caloric. It is not fitted for reſpiration, nor will it ſupport combuſtion It is the lighteſt of all the gaſes, being twelve times lighter than common air, and hence it is uſed for filling balloons, and is uſually obtained for this purpoſe by pouring vitriolic acid on iron filings.

The diſengagement of it is the cauſe of moſt of the exploſions that take place in chemical proceſſes. Thunder proceeds from the hydrogen of the water ſuſpended in the air, taking fire by means of electric fluid. When mixed with oxygen it burns with great brilliancy, if an ignited body is brought into contact with it; and it was heretofore called inflammable air.

Water is a compound body formed of hydrogen and oxygen, as is proved by various experiments in which the ſyntheſis of theſe two bodies produces it. Mr Parkinſon ſays, " It is proved by making water " in a ſtate of vapour paſs over iron wire, twiſted " and made red hot, the iron becomes oxidated, a " conſiderable portion of the water diſappears, and " hydrogen gas is produced; the iron depriving " the water of its oxygen, by which it becomes " an oxide, whilſt the hydrogen combining with " caloric, forms the hydrogen gas." The Hon. Mr. Cavendiſh produced water by paſſing an electric ſhock through oxygen air blended with inflammable air. Eighty-five grains of oxygen and fifteen grains of hydrogen, produced one hundred grains of water.

Dr. Thornton, in his elegant work, has given a plate of a machine for the purpoſe of making water, from Mr. Watt's apparatus ſimplified. Water is uſed as a beverage, being a very neceſſary part of our ſupport, and is not only taken into the ſyſtem by the mouth, but is abſorbed by the pores of the body. It almoſt always contains foreign ſubſtances, and is more or leſs wholeſome as it is more or leſs pure, and as it may be always analyzed, we are always able to detect it when unwholeſome. As the horſe takes all his fluid beverage from water, ſo the veterinarian ſhould learn to detect theſe foreign ſubſtances by chemical experiment.

The ſubſtances contained are moſtly mineral, and as they exiſt in ſome inſtances in conſiderable quantities, they are uſed medicinally, and hence it is now very uſual to ſend the ſick, to parts where particular waters abound, and the analyzation of the waters of theſe various parts has been a ſubject of diligent inveſtigation to the ingenious: among which the celebrated treatiſe of Dr. Saunders on mineral waters juſtly ranks high*.

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* "By certain natural proceſſes the atmoſphere is conſtantly "impregnated with this vapour. When in conſequence of cool-"ing or compreſſion, the caloric ſeparates from the finely di-"vided particles of water which formed the baſis of the vapour, "and which now approximate to form a liquid again, the ap-"pearance termed *fog* or *miſt*, takes place, and in the higher re-"gions,

Carbonic acid gas is the name now given to fixed air, it is likewiſe called *mephitic gas, aerial acid, &c.* It is formed of carbon, oxygen, and caloric. It is contained in very large quantities in chalk, and is generated in great plenty during the decompoſition of animal and vegetable ſubſtances, from whence ariſe many of the common phenomena in nature; as the fermentation of wine, beer, &c. and the ſwelling of dead animals. It is found in many ſubterraneous places, particularly in the *grotta del cane* near Naples. The famous lake of Averno, by Virgil poetically called the mouth of hell, conſtantly exhales carbonic acid, ſo that birds paſſing over it are ſuffocated. It is heavier than common air, which makes it occupy low ſituations, and remain in the bottom of tubs, caſks, wells, pits, and caverns. It imparts an acid taſte to water, and in this way has been uſed medicinally, for which there is a glaſs machine formed; when mixed with vital air, it has been given as a remedy in conſumption, but its effect has ſeldom been permanent. It has been uſed with ſome benefit in cancer. All ulcers almoſt put on a more favourable appearance on its exhibition. In greaſe it is often of the greateſt bene-

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" gions, *clouds* are formed from the decompoſed vapour, the ſtill " nearer approximation forming *rain*. Thus alſo may be explain- " ed the formation of *dew*, and of water on the walls and win- " dows of crowded rooms. By the more rapid ſubſtraction of " caloric the production of *hail* and of *hoar-froſt* may be eaſily " accounted for." *Parkinſon's Chemical Pocket-book.*

fit,

fit, applied in a fermenting poultice of yeaſt and flour. It is to this acid ſolution, the waters of Pyrmont and Seltz owe their medicinal virtues. It exiſts in a concrete ſtate combined with earths, with alkalies, and ſome other ſubſtances, under which forms it becomes a very powerful remedy, and renders the earths and alkalies it enters into, mild, which when pure are cauſtic; hence we have *Carbonas ammoniacæ*, which is either liquid or chryſtallized, forming, in the firſt inſtance, the ammonia præparata of the London Diſpenſatory, or the volatile ſalt of hartſhorn of the ſhops; in the ſecond it forms aqua ammoniæ or ſal volatile; *Carbonas barytæ*, or terra ponderoſa aërata; *Carbonas calcis*, or the teſtaceous powders; *Carbonas magneſiæ*, or white magneſia; *Carbonas potaſſæ*, or kali preparatum of London Pharmacopœia, the ſalt of tartar of the ſhops; *Carbonas ſodæ*, or aërated mineral alkali, &c.

Carbon which is the radical of this acid, has not yet been obtained in a ſeparate ſtate; it is pure charcoal, being the black reſidue of bodies that have been decompoſed by fire; it is obtained from the animal, vegetable, and mineral kingdom, and has not yet been decompoſed from its original ſimplicity. From ſome late experiments it has been ſuppoſed that the diamond is pure charcoal.

There are ſome other gaſes, as the *nitrous*, *muriatic*, *hydrocarbonate*, but as they are either compounded of others or of ſmall import, we refer the deſcription to the treatiſes on chemiſtry.

Caloric ; modern chemiſts have denominated heat by this term, and its effects are thought dependant on a certain matter which is called the *matter of heat.* Mr. Parkinſon ſays of caloric, " It appears " to be an highly elaſtic imponderable fluid, and is " ſo very ſubtle that neither has its gravity been yet " aſcertained, nor its exiſtence in a ſimple and uncombined ſtate been ſhewn. It combines che-" mically with all bodies, in a quantity proportioned " to their affinity with it. By its elaſtic power it " conſtantly tends to ſeparate the particles of matter, " in which it is oppoſed by the attraction of cohe-" ſion ; hence attraction of coheſion predominating, " the body exiſts in a ſolid form ; caloric exiſting in " ſuch a proportion as to weaken the attraction of " coheſion to a certain degree, the body aſſumes a " liquid form, and when the quantity of caloric is " encreaſed ſtill further, the body takes a gaſeous " form."

Bodies contain heat in a combined form, or according to Dr. Black, *latent heat*, which is not perceptible to the touch or ſight ; or heat exiſts in a ſtate now called *free* or *ſenſible*, in which we ſee its appearance and feel its influence. But there are circumſtances attending this peculiar ſomething, that are at preſent out of our reach.

Light has been ſuppoſed connected with heat, but it is now more univerſally acknowledged as a body or matter *ſui generis*; and this is more fully proved ſince it has been found to be ponderous, and to follow the laws of gravitation. It is a very elaſtic fluid reflected from all bodies it cannot penetrate, and performing great changes in bodies it does enter. The powers of its operations are now known to be very great, and very univerſal, and many of the great changes attributed to other cauſes, are now known to be brought about by the preſence of light. It is to light that vegetables are indebted for their colour, an many other of their properties, hence gardeners, by placing tiles or covers over endive, render it white, by excluding the light from it; and hence it is that vegetables will turn out of their natural courſe to gain light.

I have thus endeavoured to explain ſome of the more general terms that occur in chemiſtry, and ſuch as will be often met with in the courſe of this work; and though attempting even the moſt conciſe account of this ſcience may be deemed by ſome deſultory, and a wandering from the ſubject, yet when the following circumſtances are taken into conſideration, with ſenſible minds, I ſhall ſtand excuſed: 1ſt. Its great importance. 2dly. That every one may have a reference to any term introduced. 3dly. and much more particularly, That as I propoſe not only to teach what is neceſſary, but to ſhew the way to further improvement, ſo I ſhall by this ſhort account have ſhewn the utility, the neceſſity, and the real beauty of this ſcience, and by this means more forcibly ſtimulate the ſtudent to further reſearch in a ſtudy, whoſe object is the inveſtigation of every ſubſtance that enters the globe. After the materia medica, which ſhould certainly precede this reſearch, chemiſtry follows naturally, by which the nature of the changes the compounding bodies may produce, are underſtood, whoſe ſingle virtues we were acquainted with, but whoſe combinations and decompoſitions may have become materially altered. Without a knowledge of chemiſtry, phyſiology will be but an unpleaſant and in a degree a uſeleſs ſtudy; it is by this we are to learn the various relations that animate and inanimate bodies ſtand in with regard to each other; and in fact without an acquaintance with this branch of knowledge, the veterinarian will be continually at a loſs.

Thoſe who are in poſſeſſion of Dr. Thornton's elegant work, will find the outlines of chemiſtry laid down in a clear and pleaſing manner; it will be eaſily ſeen I have derived ſome hints from this ſource, as well as from the ingenious and uſeful manual of Mr. Parkinſon, called the Chemical Pocket Book. The ſtudent may proſecute his enquiries in modern chemiſtry by a recourſe to Fourcroy's Chemiſtry, Gren's Principles of Modern Chemiſtry, 2 vols. La Grange's Manual, 1 vol. Briſſon's Phyſical Principles, 1 vol. Garnet's Outlines of a Courſe of Lectures, 1 vol. and Henry's Epitome of Chemiſtry, ſmall volume.

SECTION VI.

Of living Matter, or Comparative Anatomy.

WE have in a conciſe manner ſhewn what dead matter was, it now becomes our next object to treat of *living matter*, which is totally different, having faculties and powers independant of ſurrounding objects, and principally diſtinguiſhed by its power of aſſimilating theſe ſurrounding objects into its own nature, and of reſiſting the action of external bodies upon it. The principle effecting theſe powers is diffuſed throughout animated nature, and is called *life*, which eſpecially diſtinguiſhes common or dead from living matter: yet there is a regular and beautiful order and method obſerved throughout the material world, a ſyſtematic arrangement is obſerved, by which a gradatory whole is formed; the links of this grand chain vary ſo gradually, that the extremes of the one order and the beginning of the other, are with difficulty traced; ſome vegetables, by their ſhapeleſs maſs, and the ſmall appearance of life they exhibit, approach nearly to the character of mineral matter; while the coral, polipy, and other inſtances, exhibit all the phenomena of vegetable life. This wonderful connection in the material world has of late years been the ſubject of much inveſtigation, and by this means our knowledge has been much encreaſed, and much light thrown on the beauty, and order of nature. By our acquaintance with the ſtructure and œconomy of plants, we have been led into a compariſon that ſhews the difference between animals and vegetables, by no means equal to what was ſuppoſed by the antients. They reſpire, they digeſt, and they have ſexual organs for propagation*. Life therefore forms the great diſtinction between common and mineral matter, and animated or living matter *. Animals and vegetables have this principle pervading every part of their ſeveral frames. Life has in every age engaged the attention of the philoſopher, and various have been the theories formed with regard to it. It can in no wiſe be conſidered but as connected with matter, yet we have no reaſon to conſider it as material: it has been compared to a ſpring, to magnetiſm, and to electricity; but theſe cannot explain the phenomena of life. One of the greateſt errors philoſophers ever fell into, and one of the moſt dangerous, has originated in conſidering life as material.

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* Philoſophers have for a long time been attentive to the claſſification of vegetables ; but their organization and functions have been but little underſtood till within the laſt half century. Senebier, a foreigner, has diſtinguiſhed himſelf much on this head, by his treatiſe on the *Anatomy and Phyſiology of Vegetables* in 5 vols. publiſhed at Geneva, This ingenious author firſt diſcovered the influence of light on vegetables, and though he admits of the great connection between them and animals, yet he endeavours to prove, that by ſtraining the compariſon too far, we have been drawn into error. Plants, he ſays, do not poſſeſs ſpontaneous motion, nor ſenſibility, nor is irritability in them, he thinks, clearly proved, The wood has been compared to the bones, but the one he ſays is formed from the bark, the other takes nothing from the fleſh. (It would appear from this, Senebier does not conſider bones as formed from the veſſels of the perioſteum.) The wood continually encreaſes, the bones only to a certain time. He might have added perhaps as an argument, that the matter of bones is continually changing ; no certain proof exiſts that the depoſit of wood is ever removed. A wound in the wood, he adds, is incurable, but a broken bone becomes conſolidated, &c.

Life is difficult to characteriſe; it cannot be done ſo by motion, for moſt vegetables are quieſcent, and an egg has life though no motion: even fluids are proved to have life †. But it gains its ſtrongeſt character

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* "Lapides creſcunt; vegetabilia creſcunt, et vivunt; "animalia creſcunt, vivunt, et ſentiunt." Some eminent philoſophers have contended that even minerals have a ſpecies of ſubordinate life, and that to it was owing the regular arrangement of their particles, when ſuffered to chryſtalize; but this is by no means proved.

† "Our ideas of life have been too much connected with or-"ganic bodies, and principally thoſe endowed with *viſible action*, "that it requires a new bend to the mind to make it conceive "that theſe circumſtances are not inſeparable, &c. &c."

Hunter on the Blood, p. 178.

"A natural body is neither its organization nor its figure, "nor any of thoſe inferior forms which make up the ſyſtem of "its character from the power it gives the ſyſtem whether vegetable or animal, to reſiſt the action of external objects; at the ſame time enabling it to act upon ſubſtances foreign to itſelf. By the firſt it preſerves itſelf from putrefaction and decay, by the latter it deſtroys the ſenſible qualities of the ſubſtances it acts upon, and aſſimilates them into its own nature; but deprive the ſyſtem of life, its aſſimilating powers fail, its elementary principles become decompoſed, and it falls into a ſtate of putrefaction and decay. Neither muſt growth be conſidered as eſſential to life, as ſtones grow we have reaſon to believe. Irritability has been conſidered as more nearly allied to ſimple life, than any thing beſides *. Life is diffuſed throughout the whole of every animated ſyſtem, and appears to be divided into two ſtates. The firſt is called by Mr. Hunter, *Materia vitæ diffuſa* †, as being a general diffuſed principle by which the whole was preſerved, and enabled to

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"its viſible qualities; but it is the power, which not being that "organization, nor thoſe qualities, is yet able to produce, to preſerve, and to employ them." *Harris.*

* Yet it has been ſaid we fall into error by confounding life with irritability, by Plench in his *Hygrologia Corporis Humani.* He conſiders life as threefold in every animal, *chemical life*, *phyſical life*, and *phyſiological life.*

† Mr. Saumarez objects to this term as erroneous, it ſhould be he ſays, *principium vitæ diffuſæ.* "The materia vitæ is only "an effect of which the principium vitæ is the cauſe. The "principium vitæ is the power; the materia vitæ is the energy of "that power."

reſiſt external agents. But as every animated ſyſtem is compoſed of various organs whoſe functions are eſſentially different, as the ſtomach to digeſt, the liver to ſecrete bile, and the kidneys urine; ſo they have a life peculiar to themſelves, or a power emanating from life which Mr. Hunter has termed, *Materia vitæ coacervata*. This may be dormant or loſt, while the general one remains entire. Palſy deprives an organ of its ſpecific action, as a gland of its ſecreting energy; but by its *materia vitæ diffuſa*, it is enabled to reſiſt putrefaction. Theſe two principles have been very ingeniouſly illuſtrated by Mr. Saumarez. The vegetable world in the winter is in a torpid ſtate, its actions are all ſuſpended, from a ſuſpenſion of the materia vitæ coacervata; but it falls not into decay, for its materia vitæ diffuſa ſtill continues. Fruit ſeparated from the tree no longer grows, having loſt the former, but it does not immediately die, having ſtill the latter, the power of retaining which is very different in different fruits; thus while a pear quickly falls into decompoſition and becomes rotten, an apple remains living and preſerved many months. It may be added as another illuſtration, that an egg receives its materia vitæ diffuſa from the hen, but its materia vitæ coacervata is given by the cock; thus an egg laid without the influence of the male does not immediately die, but it can never be hatched, no ſpecific action can go forward within, it has the preſerving but not the acting life.

Different ſyſtems vary in their power of retaining this principle, the more ſimple is the animated machine, the more tenacious it is uſually of life: vegetables and the lower orders of inſects can bear the loſs of their limbs and heads, and can even renew them. The heads of ſnails will grow again in ſix weeks. A polipy cut into pieces has the power of forming a polipy out of every diſtinct portion. Flies ſent in wine to the Eaſt Indies have recovered on expoſure to the air, and ſome inſects baked in an oven even to criſpneſs, have recovered on being moiſtened with water. The amphibia, as the frog, turtle, &c. will live ſeveral days after the loſs of both head and heart; and a frog beheaded in the act of propagation, will not deſiſt till he has completed his object. The higher order of animals, as more perfect machines, are leſs tenacious of life; and man, as the higheſt and moſt perfect order, is leaſt tenacious of all; hence he loſes his life under circumſtances that are ſeldom fatal to animals; the cavity of the belly is opened every day into with impunity in ſpaying animals, but any penetration of this cavity in the human is uſually fatal. An animal will bear the diviſion of a large artery; even a ſmall one divided has occaſioned death in a man. We have therefore ſeen that life is common to animals and vegetables, and we have ſhewn that the latter have many parts in common with animals. Their œconomy is ſtill more ſimilar than their ſtructure. Plants cannot live without air, which they very rapidly abſorb; and it is remarkable that they appear beſt ſupported by air that is unfriendly to man. They digeſt very perfectly, having the power from ſimple water to aſſimilate to their own nature its qualities, decompoſing it into its firſt principles, hydrogen and oxygen. Cabbages have been made to grow by putting their ſeeds on flannel, and ſprinkling them with diſtilled water alone.

Plants have likewiſe male and female organs, the mutual product of which it is neceſſary ſhould come into contact for the purpoſe of fructification.

The flowers of ſome vegetables contain both male and female parts, others have diſtinct male and female flowers; this is exemplified in cucumbers, where gardeners are in the habits of taking the male flower from off the ſtalk, and applying it to a female flower, which they diſtinguiſh by its having a ſmall cucumber attached, which after this fœcundating proceſs, grows and perfects: but in fine weather this is unneceſſary, as the application of the male farina is effected equally well by bees and other inſects ſearching for honey; even the wind itſelf is carrying on this ſexual intercourſe. Plants are enabled to vary their track to ſearch for light; and ſome of them exhibit ſomething ſimilar to ſenſation, as the ſenſitive plant, hedyſarum gyrans, which recedes on being touched: others are ſaid to have a diſpoſition to face the ſun, and ſome we know cloſe their flowers on the approach of rain, or the coming on of evening, as the convolvulus tribe: but this has been ſaid not to be owing to ſenſibility, but irritability, as muſcular fibre recedes from the point of an inſtrument in the firſt hours after death. By this we draw two inferences; that there is a vaſt connection throughout animated exiſtence ; that vegetables and animals have many properties, and many functions in common ; and that life is a principle equally diffuſed throughout each, and common to both : hence therefore though vegetables are clearly diſtinguiſhed from minerals by their poſſeſſing life, the diſtinction between vegetables and animals is by no means ſo definite, ſeeing they poſſeſs ſo many common properties. Mr. Hunter characteriſed animals by the preſence of a ſtomach ; but this it is now known cannot form a ſpecific diſtinction, as ſome animals as the tænia and hydatids have no ſtomach properly ſo called, but receive nouriſhment from organs placed over the whole body : and conſidering a ſtomach as a ſimple organ having the powers of aſſimilation, it may be ſaid that vegetables have a very comprehenſive one. Animals have been diſtinguiſhed from vegetables by their being enabled to move in queſt of their food, while the other remain fixed and contented with the ſubſtances they meet with in their confined ſituation : but this diſtinction likewiſe cannot be admitted, for many animals, as oyſters, &c. have no locomotive power, but obey the impulſes of ſurrounding bodies, or remain for ever ſtationary ; add to which vegetables have a power of travelling much out of their uſual courſe to ſeek light or water. Animals have again been diſtinguiſhed from vegetables from the nervous power they poſſeſs, and perhaps this forms the moſt ſtriking difference between theſe two ſyſtems: yet even this cannot be admitted as univerſal probably.

The habits and manners of the various animal forms belong to natural hiſtory, their ſtructure and functions to zootomy or comparative anatomy. *Comparative Anatomy* is that ſcience that demonſtrates the various organs of the individuals of animated nature; not only of animals but of vegetables: but which, till within a few years, were not conſidered as affording much of this comparative knowledge. Malpighi, and Dr. Grew, firſt ſhewed its importance, which was ſtrengthened by Ruyſch; ſince which time the ſtructure and œconomy of plants has been much enquired into. The information gained from examining the ſtructure of animals and vegetables, is uſually compared with ſimilar information gained from the human body, or the parts are themſelves compared, and hence this reſearch is called comparative anatomy. The utility of this branch of knowledge was early inſiſted on, and Malpighi has at large anſwered all the objections raiſed againſt it; phyſiology owes to this ſource moſt of its improvements, and analogy has aſſiſted both in phyſic and ſurgery.

Animated nature is not be conſidered as made up of detached unconnected parts, but of one beautiful gradatory whole, blended with the niceſt harmony into a vaſt chain, which has its origin in the moſt ſimple living vegetable form, and its ſummit in man. The forms occupying the firſt portions of the ſcale are ſimple, and poſſeſſed of numerous reſources: as it advances, theſe become more complex, their external wants more numerous, their means of ſupply reduced, and the powers of propagation decreaſed. Thus vegetables are more complex in their forms than minerals, animals more ſo than vegetables, and man the moſt ſo of all. Vegetables, rooted to the ſpot on which they are placed, find the means of ſupport every where around them; but animals are forced to move in ſearch of the means of ſatisfying their wants, which likewiſe are much varied, and frequently only to be obtained by force or ſtratagem. Man, whoſe wants are ſtill more numerous, is forced to cultivate all the ſocial arts to be enabled to gratify them. Plants propagate their ſpecies infinitely ſuperior to animals or vegetables, ſome of them producing many thouſand ſeeds. The lower orders of animals have this power likewiſe in a very extended degree; and it is wiſely ſo ordained, that the more deſtructive are confined in their powers, while the uſeful are multiplied with aſtoniſhing rapidity. Some inſects, as the mite, can propagate themſelves a thouſand times in a few days. A turtle has produced from two to three thouſand eggs at one time. A hen lays forty or fifty eggs in a ſeaſon; while the predacious birds uſually rear but two or three in the ſame time, and man and the larger animals produce but one annually. Some of them, whoſe bulk would render their numbers particularly deſtructive, are multiplied even more ſlowly*.

Comparative anatomy is therefore the demonſtrating the ſtructure and functions of the ſeveral parts of which this great chain is formed; that part of it which regards the œconomy of plants, the ſtudent will find in the numerous botanical works now extant. *Animal matter* is that with which we are more immediately connected, and which preſents itſelf under the varied forms of inſects, fiſhes, fowls, amphibia, quadrupeds, and man. Though the varieties are endleſs, yet the whole of theſe are formed after one great plan, with organs that, though highly diverſified, have yet ſtrong characteriſtic ſimilitudes; and though the habits and manners have infinite diverſity, yet their functions are carried on by means in eſſentials ſimilar; hence the œconomy of one tends to throw great light on that of another, and parts leſs apparent in one become diſtinct in another. Thus a general knowledge of this ſcience is neceſſary to every medical ſtudent; and a more intimate acquaintance with it will be found highly uſeful and gratifying. It is by this, that the real intention of nature in the formation of parts is beſt underſtood; this becomes the baſis of all phyſiological knowledge; and by this the mind becomes expanded, and we not only gain juſt but extended ideas of the ſtructure, functions, and œconomy of various animals. To the veterinarian it is more ſtrikingly neceſſary, for as his art profeſſes to treat all the diſeaſes to which animals in general are liable, ſo an acquaintance with the principal varieties is obviouſly neceſſary to be known. A vomit might with propriety be given to a dog, but no ſubſtance could produce this effect on a horſe.

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* Mr. Saumarez has ingeniouſly inferred, That from the great degree of living power, and the extended means of propagation vegetables poſſeſs, while they are deſtitute of organs of ſenſe, that *the propagation of the ſpecies alone* was the final cauſe of their exiſtence; while on viewing brutes it appears the means in them of reſtoration and ſupport is leſs extenſive, and ſubſervient to the organs of ſenſe, the gratification of which was the motive by which their actions were impelled; therefore in them *the gratification of the appetite and propagation of the ſpecies* were the ultimate ends of their formation. But in man, whoſe rational powers are extenſive while his organs of ſenſe are weak, the gratification of his appetite cannot be one of the ends of his exiſtence, nor yet the propagation of his ſpecies, in which the means are more limited than the brute; but that the final cauſe of human exiſtence muſt be, *the adoration of the Deity, and the exerciſe of the moral virtues.*

An animal conſiſts of a great number of parts, as bones, horn, ſhell, muſcles, arteries, veins, nerves, glands, abſorbent veſſels, blood, and ſecreted fluids, which terms ought to be in ſome meaſure underſtood before we begin an explanation of any individual animal body. *Bones* form the baſe of the machine in birds, quadrupeds, and in moſt fiſhes. Some fiſhes, inſtead of bone, have a *cruſtaceous cover-*

ing, by which their form is ſupported and protected. Inſects have many of them either a cruſtaceous or membranous covering inſtead of bone, but ſome have neither, and are wholly made up of ſoft parts. Bones are moved by *muſcles*, which are fibrous ſubſtances, in quadrupeds uſually red, in ſome birds and in moſt fiſhes white. Theſe fibres have a contractile power, which enables the animal to move by contracting and expanding the part they are attached to; they have in moſt animals inelaſtic chords, attached to them, called *tendons*. Theſe parts have a general tendency to exhauſtion, to weakneſs and decay, which is counteracted by food. Nouriſhment is received in the hyatid tribe, like vegetables, from their external ſurface; in the polipy it is received into a general bag of which the animal is wholly compoſed. In the more complex animals it is received into the mouth, in ſome it is here maſticated by organs called teeth, in others it is ſimply ſwallowed; but in almoſt all it enters a membranous bag called a *ſtomach*. In ſome there is more than one of theſe bags; fowls have the addition of crops and gizzards; and ruminant animals have two, three, or even four of them; but the proceſs of ſolution of the food is carried on only in one, which is called the true digeſtive ſtomach; from whence it paſſes into other canals termed *inteſtines*, where the nutritious portion is ſeparated, and the fæcal carried off. The nutritious part is converted into blood, being carried from the inteſtines by means of veſſels termed abſorbents. *Blood* is a fluid that is eſſential to animal life; it becomes more compounded as animals become more complex; in vegetables it is called *ſap*, and will not in ſome coagulate; in inſects this fluid is moſtly colourleſs, but it coagulates; and in the animals occupying the higher orders, it has red particles ſuperadded. This fluid circulates through the machine by means of reſervoirs and canals. In ſome inſects there is a ſimple canal admitting the undulation of the blood; in others a reſervoir of one cavity is added, called the *heart*; as they become more complex, there are two ſets of canals, *arteries* carrying the blood from the reſervoir, and *veins* returning it. *The heart* itſelf gradually becomes more complex till it has two, three, and at laſt four cavities in man and quadrupeds. Blood receives an alteration in its properties by the action of the air. In inſects this is received by means of pores ſpread over the body. Fiſh have *gills* through which, as the water paſſes, the air is abſorbed. The amphibia have *lungs* of a peculiar ſtructure, and the ſyren has both lungs and gills; hence may be ſaid to be the only true amphibious animal we are acquainted with. Quadrupeds and birds receive air through a tube in the throat, called the *trachea*, from whence it paſſes into the lungs. Animals before birth, receive this action of the air; the vaſcular lining of the egg-ſhell is lungs to the chicken, and the placenta or after-birth, forms the true fœtal lungs in viviparous animals. From this ſource heat is derived, which is called *animal heat*;

but all animals have not warm blood. Fiſh and the amphibia have uſually blood of the temperature or nearly ſo of the ſurrounding medium; hence they are called cold-blooded animals. Beſides blood there are ſeveral other fluids in the body, which are moſtly ſecreted from it; the organs performing this ſecretion are called *glands*, the liver is a gland to ſecrete bile, the kidneys urine, and the udder milk.

The motions of animals depend on the operations of the nervous influence upon the muſcles. *The nervous ſyſtem*, in complex animals, conſiſts of a pulpy ſubſtance lodged within the ſkull called *brain*, and white fibrous chords named *nerves*. In the ſnail the brain is a circular nerve merely, with ramifications to every part of the animal; in other inſects, the origin of the nerves is from a bulbous extremity, which anſwers the intention of brain. In birds and fiſhes it is more complex, and in quadrupeds very ſimilar to the human. The organs of ſenſe in animals preſent very conſiderable varieties, yet it is admirable to obſerve the ſtriking coincidence throughout in the ends they produce. The organ of taſte reſides in the *tongue* and *fauces*, and appears only a modification of touch, and is very variouſly formed in different animals. The ſenſe of ſmelling is more complicated in moſt animals than in man. The organ of hearing is acute according to the habits of the animal; the external ear is very various in its form; the internal is more complex in birds and beaſts than in fiſhes. The organs of viſion are wonderouſly diverſified according to the various modes of life in the animal. In fiſh there is an inſenſible tranſparent pellicle over the eye, adapting it to this watery medium. In birds and beaſts, as they have not hands to protect theſe ſenſible parts, they have an additional covering from the *membrana nictitans* and a power of withdrawing the eye within the orbit, by means of *a retractor muſcle.* The eyes of ſome inſects are curiouſly reticulated to encreaſe the ſurface of viſion, and beaſts of prey have a variegated *tapetum* or poſterior covering, to enable them to ſee well in the night. Theſe animated machines all finally decay and are loſt by death; but that the ſpecies may not become extinct, they live again in their progeny.

Propagation is effected by means of certain organs, which are divided among animals; thoſe poſſeſſing the one are termed males, the other females, but ſome appear to be true hermaphrodites, having both the parts in the ſame body: uſually however the labour, care, and trouble is divided between a male and female, that by the negligence and wants of one, the end might not be fruſtrated.

Of Inſects.

Inſects, taken in the moſt extenſive ſenſe that that term is uſed, are very variouſly formed according to their various habits and uſes. They uſually want bones, but ſome have a cruſtaceous covering which is ſecreted from their ſurfaces, while others, as worms, have ſimply an external membrane, enabling them to wind in the interſtices of the earth. Some mount the air by means of wings, others are confined to the ground, but have numerous legs, and ſome of the reptile tribe move by means of an energetic force of one half of the body, while the other half reſting on the ground, forms a reſiſtance. Some inſects have a brain and nerves, ſome have only a ſingle ramified nerve; they have likewiſe a ſtomach, which in ſome, as the tænia, is placed in tubes throughout the body; in others, as the polipy, the whole cavity of the body forms the ſtomach. The food received in the higher orders is paſſed off by inteſtines. The eyes in inſects are uſually a very curious ſtructure, and are reticulated, by which each becomes a maſs of ſome thouſand viſual organs; as the facettes of a diamond, each preſents a new ſurface; we may therefore judge how perfect muſt be their viſion. The ſpider has his head formed into a locket of ſeveral eyes, by which he can ſee his prey without turning his head, which would probably frighten it away before he had entangled it ſufficiently. Theſe hemiſpheres are ſo numerous in ſome inſects, that Mr. Hook computed 14,000 in the two eyes of a drone, and Lewenhock 6236 in a ſilk worm. In ſnails, whoſe motions are ſlow, and the head nearly fixed, the eyes are rendered moveable by being placed like atramentous ſpots at the ends of their four horns; in the higher orders there is a heart and blood-veſſels, with colourleſs coagulating blood; this blood receives its alteration from the air, as in other animals; but not through the medium of the mouth, but by means of numerous ſpiracula or pores ſpread over the body; and hence it is, that beſmearing moſt inſects over with oil immediately ſuffocates them; but ſome of them receive this change in another manner, for ſeveral of the worm tribe are not killed by this means; and this ſhews the inefficacy of giving oil to mankind, or horſes, to kill worms, as has been frequently done. Noxious airs likewiſe kill them by the effect they produce on the blood; thus they are immediately killed by the fumes of ſulphur. Inſects are uſually oviparous, and very prolific; having many enemies it was neceſſary their means of renovation ſhould be very extended.

Of Fiſhes.

The various tribes of fiſh prove them a more complex animal, and that they rank higher in the animated ſcale; yet the diſtinctions between them and the other parts of the chain are nicely ſoftened. The exact line between them and the inſect tribes is very difficult to trace. The amphibia unites them with beaſts, and the flying fiſh and ſome others, give them ſome connection with birds; add to which, ſome aquatic fowls in their habits and manners aſſume almoſt all the characters of fiſh. This ſpecies of animal is much diverſified in form; nothing can be conceived more various than the different kinds of ſhell-fiſh, which are many of them very ſimple, and only a ſpecies of aquatic inſect; their cruſtaceous covering is a ſecretion from the ſurface of their bodies, and in ſome is renewed annually, and in others remains through life. Some of this kind have parts eaſily diſtinguiſhed, and are bleſſed with locomotive powers, as the lobſter, crab, &c.; others are more ſimple, and are moved only by chance, as oyſters, ſcollops, and many others. But the ſcaly tribes, and thoſe who move by membranous fins, are a more complex animal, propelling themſelves forward by means of the reſiſtance the water forms to their membranaceous oars. They ſink or riſe likewiſe in this medium, by encreaſing their ſpecific gravity or diminiſhing it; this is effected by means of a veſſel filled at pleaſure with air, and condenſed *ad libitum*. This kind of fiſh, which is by far the moſt numerous and important, have bones for the baſe of their ſyſtem, but which are in ſome reſpects diſſimilar to the bones of terreſtrial animals. They are uſually protected by a ſtrong cuticle covered with ſcales, laid one over another, and the whole is rendered ſlippery by means of a mucus, ſecreted and paſſing through certain ducts; by this means they elude the graſp of their purſuers. Every one muſt have experienced the difficulty of holding an eel without the intervention of ſand. They have very ſtrong muſcles, which do not uſually receive red blood; hence fiſh are commonly white, but which is not univerſal, as the ſalmon, trout, and ſalmon-trout, have red muſcles. May not this be conſidered as an argument againſt Mr. Hunter's opinion, that though red particles were a ſubordinate part of the blood, they were ſomehow connected with ſtrength? The muſcular fibres are not placed one upon another in a longitudinal direction, but are laid either in a tranſverſe or an oblique manner, one behind another, from the anterior part of the body to the tail. In the ſpinal fiſhes theſe muſcles can be divided into dorſal, pectoral, neutral, and thoſe of the head and tail. They are moſtly carnivorous animals, though ſome live indiſcriminately on vegetable or animal matter. Carp eat bread, peas, and other vegetables with avidity. Their ſtomach is oblong, and with difficulty diſtinguiſhed from the œſophagus; where food will lie ſome time without alteration, till as it becomes diſſolved in the true digeſtive part, it paſſes from the œſophagus; thus jack and other voracious fiſh will ſometimes gorge themſelves with one of half their own bulk. The fœces are evacuated at one common vent with the urine and ſemen. Moſt fiſhes have a heart compoſed of one auricle and ventricle, and a general circulatory ſyſtem. The parts we term gills form the lungs of fiſhes; they are red fibrillæ of a ſemicircular form, ſituated below the head and covered by two flaps; by theſe the water is received into the mouth in the ſame manner we receive air, is paſſing through the gills as the air paſſes through our lungs, during which time the oxygen is ſeparated from the water, and the blood in the gills undergoes its change; this blood does not however paſs into the heart, but the branches immediately uniting form an aorta poſterior, without the aſſiſtance of another auricle and ventricle. Fiſh are furniſhed with an abſorbent ſyſtem, and have likewiſe a liver, pancreas, and ſpleen; thus they riſe high in the ſcale of complex animals. Their brain is very evident, and their organs of ſenſe very acute; their wily cunning either to entrap others, or to eſcape the ſnares laid for them, is well known to every naturaliſt, and much felt by every ſportſman. The eye greatly ſurpaſſes in proportionate ſize that of quadrupeds; the chryſtalline lens is likewiſe more ſpherical and denſe, that the rays may be more refracted. By their tapetum or poſterior membrane, they collect all the ſcattered rays at night, whereby they can ſee very diſtinctly at that time; and as they are continually expoſed to danger, ſo they have no eye-lids, that they might never be off their guard; but that they may not ſuffer by this expoſure, there is a cuticular tranſparent covering over the cornea. The organ of ſmelling is acute, and plentifully ſupplied with nerves; the noſe is ſituated far back, and the olfactory membrane dark, and ſpread on cartilaginous ſepta. That they ſmell acutely is well known to fiſhermen, who entice them with various eſſential oils. Profeſſor Monro has demonſtrated the ear of theſe animals with great accuracy, in his elegant work on their anatomy. Fiſhes are male and female; the male has two teſtes called the ſoft roe, and the female two ovaria called the hard roe; theſe during winter, when the great work of propagation is dormant, are empty and fluid, when they are ſaid to be out of ſeaſon, and by epicures rejected; but as the time of ſpawning approaches, they become much enlarged, and the fiſh is by amateurs then ſaid to be in ſeaſon. During this time they congregate in ſhoals, and ſeek convenient places where the ſpawn may be depoſited in ſafety; at the moment this is done by the female, the male renders it prolific by ſhedding the ſoft roe upon it. The whale is an exception to this general mode of propagation in fiſhes, the male having a penis intrans, and the female a uterus, by which they copulate; and the female brings forth a young which ſucks as other animals of the mammalia claſs.

Of Birds.

Fowls are elegantly and lightly formed; highly adapted for buoyancy, while their pointed head, long neck, and taper bodies form them for cutting through the medium they were intended to traverſe. On obſervation, we ſhall find all animals intended for ſpeed have this form; the greyhound is pointed, long, and taper; had the race-horſe the wide extended

tended forehead of the ox, the reſiſtance to his progreſſion would have been conſiderable. Independant of the common membranes birds have a covering peculiar to themſelves, but admirably adapted to preſerve warmth, and to render them light. Water-fowls have a power of ſmearing their feathers over with oil, by which their ſkins are preſerved dry. The power in birds to float through a medium ſo rare as the air, is one of the moſt curious phenomena in nature; the centre of gravity is placed a little below the wings, and below the centre of motion, by which their legs are always kept in the moſt favourable poſition for them to alight on the ground. Thoſe who have ſhort tails extend their legs out as a counterpoiſe, more eſpecially when the neck is long, as in the heron. The ſtrongeſt muſcles of the body are the pectorals, by which means, though the wings are formed of the lighteſt and ſofteſt materials, they have great ſtrength, enabling them to ſtrike the air with conſiderable force, by the reſiſtance of which they throw themſelves forward. The wings are not returned in the ſame extended manner, or the action and re-action would counterbalance each other; but they are inclined ſo as to oppoſe their edges only to the reſiſtence of the air. Their legs are ſituated far back, ſo that they walk nearly upright to preſerve the proper centre of gravity*.

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* See Wilkinſon's Phyſiological and Philoſophical Eſſays, where this ſubject is treated with great ingenuity, and in Borelli.

The external form of birds differs much, according to their various modes of life, but their internal ſtructure in eſſentials is nearly ſimilar. Predacious birds, as the eagle and hawk, are furniſhed with ſtrong weapons of offence; their bills are ſharp and ſtrong, and their talons firm and crooked, by which they hold the prey they have ſeized; ſome of them engage with their wings, with which they can give very forcible blows; it is ſaid, a ſwan has broken the arm of a man by a ſtroke, and when the ſternum, which in birds is very large and covered with ſtrong pectoral muſcles, is examined, it might be readily ſuppoſed this might happen. Others among this claſs of animals make uſe of their legs principally in fighting, which are, like the game-cock, armed with ſpurs*. Others again truſt to their bills principally.

The

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* Though the game-cock makes much uſe of his bill, yet he annoys his antagoniſt moſt with his ſpurs; but the force of the ſtroke is not given with the muſcles of the leg, but with thoſe of the wings, which act at the moment very ſtrongly on the legs, and frequently ſtrike the ſpur through the antagoniſt; thus cock-fighters cut off the ends of the feathers of the wings by which the reſiſtance of the air is decreaſed, and the ſtroke made conſequently ſtronger.

A young oſtrich in the poſſeſſion of Captain Alymer of Winchelſea, would run ſwiftly after every one who had offended him, and when he overtook them would give a kick with his foot on the back of the offender, and this with ſuch ſtrength, that a boy of fourteen was uſually forced down. This curious animal became exceedingly tame and domeſticated, ſtrongly attached

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The legs of birds are adapted to the mode of life they purſue; in aquatic fowls they have a membrane interpoſed betwixt the toes, by which they act on the water with greater force. Mr. White in his Naturaliſt's Calendar, informs us they uſe their wings in diving to aſſiſt their legs. The contraction of the toes, when the foot is drawn in, is effected without the intervention of any appropriate muſcles; but it ariſes, Dr. Monro ſays, from the ſhortneſs of the tendons inſerted into them; therefore the contraction of the toes is natural on a bent poſition of the leg, and independant of the will; by this means birds perching aſleep have the claws naturally cloſed, and are not in danger of falling from the relaxation of the muſcles; by this likewiſe the toes of aquatic birds are drawn up together in ſwimming, forming a leſs reſiſtance to their return.

The bill of fowls is compoſed of two mandibulæ, the lower of which only has motion; except in

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to the perſons he was habituated to, and perfectly harmleſs and inoffenſive in his manners, though bold and reſolute to a great degree to intruders; he aſſociated with, or rather permitted the free intercourſe of all the other fowls; uſed to eat as much corn nearly as a horſe, and would ſatisfy the remainder of his voracious appetite with graſs, with cabbage, or any vegetable matter, and when theſe were not at hand, with cinders, coal, dirt, or any ſubſtance whatever. During the production of his feathers, their growth appeared, Captain A. informed me, totally different from that of other fowls. He died at laſt, as was ſuppoſed, from eating a quantity of lime.

in the parrot tribe which uſe this part as a hold, in them the upper mandible has alſo conſiderable freedom. In the carnivorous the bill is ſtrong, ſharp, and crooked; in the granivorous it is ſtraight but ſtrong; but in thoſe feeding on inſects it is ſlight and weak; while in water-fowls it is uſually broad and extenſive. Birds are like quadrupeds divided into carnivorous, granivorous, and thoſe of the mixed kind, which produces ſome varieties in their organs. The carnivorous have the œſophagus terminating in an ingluvies or crop; but which is ſmaller than in thoſe who feed on grain; in ſome it is ſaid to be wholly wanting: from thence it paſſes into the ventriculus ſuccenturiatus, where it undergoes another maceration; and from this it paſſes to the true ſtomach, where it receives its final change of ſolution. The inteſtines of this tribe are ſhorter, as the proceſs of digeſtion is not ſo tedious as in thoſe feeding on grain, and in theſe there are no inteſtina cæca. As the exact counterpart of this appears in quadrupeds feeding on fleſh, as far as regards the general form of theſe parts, we become ſtrengthened in our conviction, that digeſtion is ſooner performed on animal matter; that the long track of inteſtines in the gramenivorous is for the purpoſe of retarding the food, particularly the cæcum, which in theſe animals is large, in granivorous birds double, but in the carnivorous wholly wanting; ſuch therefore is the uſe of analogy. In the granivorous fowls the crop is larger to contain a ſufficient quantity of grain, and the gizzard very ſtrong and muſcular, compoſed of two diſtinct muſcles lined with a production of the cuticle, defending it from the action of the bodies taken in. Birds have no teeth, the tongue has only ſome pointed bodies like thoſe of an ox, to prevent the food falling from the mouth; but the breaking down of the food is performed in the gizzard, which by its immenſe ſtrength triturates it; and farther to aſſiſt this, birds uſually take in a quantity of ſtones that act as teeth, which is farther illuſtrated by thoſe fiſh who really have their teeth ſituated in their ſtomach. The action of the gizzard is ſo ſtrong that a ball has been introduced with the points of needles and lancets projecting from it, which, on examination after, were found broken off, and the ſtomach unhurt; even glaſs balls have been ſaid to be acted upon, and in the oſtrich iron itſelf can be in part digeſted; it is probable, that in the contraction of this ſtomach, it may by ſome means have a power of applying itſelf only to the ſurfaces, and not to the points of bodies; and yet when the variety in the ſhape of angular ſtones is conſidered, this can hardly be ſuppoſed the ſole reaſon of its preſervation.

The cuticular coat of the gizzard ſerves to illuſtrate the uſe of this part in the ſtomach of a horſe, which is evidently intended to act as a ſpecies of gizzard; and at this part, I make no doubt, the ſtomach in that animal triturates his corn in a degree, though probably but ſlightly, yet ſufficiently ſo to render a defence againſt the pointed grain neceſſary. Is the cuticular coat in the ſtomach of horſes, and in the gizzard of fowls thicker in the old than in the young; as it is univerſally a received opinion, that preſſure tends to thicken cuticle; or does the conſtant moiſture prevent it? The duodenum receives the ducts of the liver and pancreas as in quadrupeds; the whole track of inteſtines is long and large to what they are in the carnivorous; and there are in many, two inteſtina cæca. The organs of circulation have not any varieties to induce us to dwell on them. The lungs are not divided into lobes as the motion of the ſpine is ſmall, but they are fixed to the bones all the way, and are covered by a pervious membrane, by which the air-cells of the lungs communicate with cellular openings ſpread over the abdomen, and entering the bones. Dr. Monro ſuppoſed they were to aſſiſt the animal in flight, by making him ſpecifically lighter; as a proof, ſome birds are ſaid to inflate their whole cellular membrane in this manner. Dr. Derham alſo conſidered this beautiful ſtructure in the ſame light, and that it farther aſſiſted them in their aſcents and deſcents; but Mr. Hunter has ſuppoſed them as aërial reſervoirs, when in their rapid motions the reſpiration could not be ſo freely performed. But in anſwer to this it has been objected, that they are more numerous in the oſtrich, a bird not intended for flight, than in moſt birds that have been examined; but ſo far from this being an argument againſt it, it becomes one of the ſtrongeſt illuſtrations of this opinion; for though the oſtrich does not fly, he uſes his wings with great violence to aſſiſt his running, which is incredibly faſt; hence therefore, as there is greater muſcular action neceſſary to move both legs and wings, than in thoſe who move the wings only, ſo there will be leſs force employed on the muſcles of reſpiration, and hence the greater neceſſity of theſe additional receptacles. It has been conjectured, that by aſſiſting the decompoſition of oxygen, this might account for the additional temperature of birds. They have a thin membrane, but no muſcular diaphragm. A thoracic duct, lacteals, and lymphatics are eaſily detected in theſe animals. They have no bladder, but there are two kidneys; the watery part they ſeparate from the blood is probably ſmall, and is abſorbed; for they void with their fæces a whitiſh matter ſeen at the end of the dung, and which is the urinous ſalts*. In an oſtrich diſſected before the French

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* Common ſayings are ſome of them the wiſdom of ages, others are the effort of pertneſs. *Getting up before the crow urines*, as a matter of impoſſibility, which is a very common village witticiſm, is of this kind; for, from what we have ſaid, it is evident that he who verifies this muſt riſe very early, as birds urine as often as other animals. Sending a boy for *pigeon's milk* is another country joke, under the idea of promoting a ſleeveleſs errand; but it is remarkable that pigeons are the only birds we know, that do ſecrete a milky fluid with which they feed their young from their crops.

Academy, there was ſaid to be found a bladder at the extremity of the rectum, capable of holding eight ounces of urine; but in other inſtances the two ureters terminate in the rectum.

Birds have uſually two teſtes and two penes, and the female has numerous ova attached to the loins. Theſe eggs are very ſmall and numerous, and conſiſt only of the yolk. In the laying ſeaſon, which takes place when the hen has the œſtrum upon her*, they enlarge, and one is preſſed into the oviduct to be conducted to the uterus, which lies between the loins and large inteſtines, and terminates in the anus. The oviduct ſecretes the white, which it adds to the yolk in its paſſage through it, and which oviduct is nothing more than a membranous paſſage from the ovaria to the uterus, and in fact muſt be regarded as the fallopian tubes of the human. In the uterus the ſhell is added by a ſecretion from the vaſcular ſurface of that organ. All theſe parts can be produced without the intervention of the male, and a large and apparently perfect egg can be brought forth; but ſuch eggs will not become prolific, or, in other words, can never be hatched; but the ſexual intercourſe which is performed as in quadrupeds, by the male penes entering the female vaginæ and uterus, which copulation is in birds called treading, vivifies the egg, and renders it prolific. In ſome, every freſh ovum requires the cock to tread the hen to make it fruitful, as in the greater number of fowls and ſmall birds: but in ſome few, of which the turkey is an inſtance, one intercourſe vivifies the whole *.

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* By œſtrum in animals is meant the deſire for ſexual intercourſe; in the human, characteriſed by the terms love, paſſion, deſire, &c. It appears to be that the oeſtrum is not completed, that a hen frequently lays her firſt egg very ſmall, and ſometimes the laſt alſo.

The organs of ſenſe in fowls are very acute; their brain is ſituated ſimilarly with quadrupeds, but its convolutions are not ſo numerous, and it appears to want the protuberances of nates, teſtes, fornix, corpus calloſum, &c. at leaſt theſe parts are not eaſily demonſtrable. Profeſſor Monro infers from this, that theſe parts do not fulfil any particular function of the brain, but ariſe from the form of parts: but there is reaſon to ſuppoſe this cannot be the caſe; no part is formed uſeleſs, and the abſence only takes place here as the brain is leſs complex, and has leſs to perform. It is true the functions of this part are involved in great obſcurity, and that hitherto analogy has not thrown much light on the ſubject †.——The organs of ſmell are very acute,

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* May not this be regarded as an argument in favour of the ſemen's not acting by application, but by a ſpecific ſympathy?

† The brain, profeſſor Harwood obſerves, may be conſidered as a receptacle of ſenſation, and the inſtrument of thought; but how either of the effects are brought about, we are at a loſs. One might *a priori* have hoped to find in the different animals ſome peculiarities, that might have thrown ſome light on this curious ſubject; but hitherto the moſt diligent enquiry has diſcovered

acute, particularly in the carnivorous tribe; the turbinated bones, upon which the olfactory membrane is extended, are very convoluted, to give greater extent of ſurface to the expanſion of the olfactory nerves. Theſe nerves in granivorous birds are much ſmaller than in the carnivorous, becauſe grain emits little ſcent, is preſent almoſt every where, and therefore falls under the province of the eye to diſcover: but animal matter is found only by chance, is ever moving, and therefore requires ſcent to direct its approach or vicinity. Nature is wonderfully fertile in her contrivances; the great protuberance on the head of the caſſowary, it has been demonſtrated, is for the purpoſe of encreaſing the ſurface of the olfactory expanſion with which it is lined; and, as though the olfactory nerves alone were not ſufficient to this office, Mr. Harwood has ſhewn another pair ariſing from the medulla oblongata, which he thinks are of eminent utility in ſmelling: theſe in the duck are ſpread over the mandibles both within and without; perhaps they may aſſiſt the animal in feeling ſuch ſoft bodies as are fit for ſupport, when raking water or mire, in ſearch of inſects, worms, and ſmall vegetables. Nor is the ſenſe of viſion leſs acute. The varieties in the form of the eye in birds are wonderfully adapted to their various habits and manners. By its

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covered little, and though we are every day witneſſes to the great variation in intellect, yet the apparent organization of the brain of the moſt ſtupid and moſt docile is the ſame.

contraction it is not only enabled to ſee objects near it with preciſion, but to diſtinguiſh remote objects with accuracy *. Dr. Monro obſerves the eye of birds is the ſegment of a ſmall ſphere upon a very large one; thus their eyes do not jut out of their heads as thoſe of quadrupeds, by which they are better protected from injury: they are likewiſe ſtill farther protected by a firm nictating membrane, which they draw over the eye at pleaſure; which is ſemi-tranſparent, and more compleat than the ſame organization in quadrupeds. This membrane is peculiarly apparent in thoſe birds who prowl for prey during the night, and hence are able to ſee diſtinctly at that time. This membrane appears moved by means of a muſcular apparatus; in the horſe and other quadrupeds, it is only preſſed forward by means of the retraction of the globe of the eye: but in birds it remains over the eye during the heat of the day in the nocturnal tribes; and during the ſhades of night in the others: whereas

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* The amazing acuteneſs of viſion is exemplified by what was witneſſed by Mr. Barber, in company with other gentlemen in 1778, who were on a hunting party in the Eaſt Indies. They had killed a wild boar, and left it near the tent they were regaling themſelves in: in about an hour's time, walking without their tent, they obſerved a dark ſpot in the air, this gradually encreaſed in ſize, and as it advanced proved to be a vulture flying in a line towards the animal, on which it alighted and began to feed: it is added, that in leſs than an hour ſeventy other vultures came in every direction, but moſt of them from the upper regions of the air.

in quadrupeds its action is only momentary to remove foreign bodies, ſo there was conſequently no neceſſity for a muſcular apparatus to what is as eaſily effected by the muſcles of other parts; ſo careful is nature of waſte, and ſo ſeldom is ſhe found to throw away her benefits: whatever end is intended to be brought about, ſhe goes the neareſt way to work to effect it. To enable the eye to adapt itſelf to near and diſtant objects, which as it muſt require a different focus, ſo it becomes evident there muſt by ſome means be an alteration in the figure or ſituation of the parts of the eye, influenced by the will, and adapting itſelf to the objects viewed. Nothing has occaſioned more inveſtigation than this power. Mr. Smith, in the *Philoſophical Tranſactions*, demonſtrates the laminæ of which the tranſparent cornea is compoſed to be hard, and capable of moving one upon another, by means of the tendons of the recti muſcles which are inſerted into them; by which the convexity of the eye can be encreaſed or diminiſhed, and the focus conſequently adapted to the different refractions from near or remote objects. But it has been ſuppoſed that this effect is brought about by other means *; and by ſome, the paſſing of the rays through different parts of the chryſtalline, is thought ſufficient to produce it. There appears another peculiarity in the ſtructure of the eye of birds, conſiſting in a black purſe nearly encircling the vitreous humour, and extending to the optic nerve. We may, from analogy, ſuppoſe this acts in the ſame manner with the ſmall purſes ariſing from the edge of the iris in the horſe, which are evidently intended to ſhut out the ſuperfluous rays of light.

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* Mr. Wilkinſon objects to this explanation as unſatisfactory, and farther ſays that the ſame appearance had been before deſcribed by Dr. Derham in his Phyſico Theology.

Birds have no external ear, but only a tuft of feathers covering the meatus or bony canal: an external ear would on many accounts have been inconvenient. The internal is much more complex than that of fiſhes, which conſiſts of only three ſemicircular canals, and is not very diſſimilar to that of quadrupeds. The ſenſe of hearing is ſufficiently acute, as we have conſtant opportunities of obſerving.

Amphibia.

This term is meant to expreſs ſuch animals as are equally capable of ſupporting life under water as above it; and as ſuch, correctly ſpeaking, is improperly made uſe of, for the animals ſo called have lungs, and which there is an equal neceſſity of diſtending with air as in a horſe, a dog, or as in ourſelves; the periods only of inſpiration and expiration can be protracted, but not done away *.

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* If the animals to whom this term is applied are ſtrictly deſerving of it, then, as it has juſtly been obſerved, the pearl divers

There is indeed an animal called the ſyren, which is ſaid to have both gills and lungs, and which is therefore the only ſtrictly amphibious animal we know, and which may be looked upon as the connecting link between aquatics and terreſtrials, as the remainder of the amphibia, or animals ſo called, may be regarded as the continuation of this connection, by which a very intimate communcation is kept up between them. The frog and lizard in internal ſtructure approach the finny tribes, they have only one auricle and ventricle, and their whole œconomy partakes of the ſimplicity of the watery inhabitants. The generating organs of the frog are a ſtep towards the complexity of quadrupeds, yet there is but a ſhade between them and fiſhes in this particular. The male has a teſtis ſituated in the loins, which in winter is ſmall when propagation is dormant; but in ſummer a great evolution takes place, and it then becomes very large. There is an excretory duct called vas deferens, which communicates with a ſeminal veſicle, and at laſt terminates in the anus. The female has a great number of ova or eggs ſituated in the loins, which become larger during the ſpring, and when the œſtrum becomes

divers may be ſaid to be amphibious, ſome of whom can remain twenty or even thirty minutes under water without reſpiring; which is perhaps as long as moſt of the animals ſo called can remain. A turtle cannot ſleep under water, but either ſleeps on the ſurface, or goes on ſhore for that purpoſe; this ſailors know and watch for them in both ſituations.

compleat, they are carried by means of an oviduct into the uterus, and expelled in ſome proper ſituation; more uſually in the water or near the edge, as being a proper reſidence for the young tadpole, which in the firſt inſtance partakes of the nature of a fiſh, but gradually loſes this character, ſhooting out four legs, abſorbing its tail, and forming lungs. The male frog has no penis, but connects himſelf with the female by mounting on her back, where he remains many days waiting the expulſion of the ova; when he ſprinkles them with his ſemen, but no farther ſexual intercourſe takes place between them. The ſerpent tribe, though void of extremities, yet approach quadrupeds more in their internal ſtructure than frogs, lizards, &c. They have two auricles, though but one ventricle. In them propagation is carried on by the intercourſe of ſexual organs: there are two diſtinct penes which render the ova prolific in the belly of the mother, which ova ſhe afterwards depoſits in ſome warm convenient ſituation. The viper comes a ſtep nearer to complex animals; for here the female forms a medium between the oviparous, or thoſe who produce their young from eggs, and the viviparous or thoſe who bring forth living young nouriſhed by the womb; for here there are ova, and which ova are rendered prolific in the uterus, and come to maturity there, but inſtead of being depoſited in the form of eggs, they burſt within the parent, and the little vipers come forth evolved.——The tortoiſe and turtle are another gradatory ſtep to the perfection of quadrupeds, from which they offer no eſſential difference, but in the courſe and mode of their circulation, and which variety was neceſſary to adapt them to a continuance under water for a conſiderable length of time. The heart has two diſtinct auricles, but the ventricles communicate with each other. The pulmonary veins carry their blood into the left auricle, which paſſes it to the left ventricle, and from thence to the right; from which ariſe the aorta and pulmonary artery. The blood of the aorta is ſent to every part of the body, that of the pulmonary artery paſſes into the lungs. By this means they receive only a part of the blood, and hence ſuch frequent reſpiration is unneceſſary. The air-cells of the lungs themſelves are very large, by which means the blood has a power of abſorbing a greater quantity of oxygen, whenever the animal does reſpire, and which thus ſupplies him for a conſiderable length of time: it is probable likewiſe that a conſiderable portion of air is retained in theſe cells, which, as it evolves, preſents a freſh ſurface for the abſorption of its oxygen baſe.

Of Quadrupeds.

The functions of this claſs of animals are moſt of them carried on by ſimilar organs, nevertheleſs as nature in them purſues the ſame end in ſome meaſure by different means, ſo a general account of their forms can neither be unintereſting or uſeleſs.

Quadrupeds in natural hiſtory have many diviſions into genera and claſſes, according to their external formation, or their habits and manners. Comparative anatomy regards only their ſeveral organs, in what conſiſt their peculiarities, and by what varieties ſimilar ends are brought about. By this compariſon much is gained; it is by this the true and real uſe of parts becomes manifeſt. A collection of the facts ariſing from this ſtudy, throws more light on the ſcience of medicine than all the wild theory and uſeleſs ſpeculation, that has ever been advanced. In the formation of animal bodies we find much not only to inſtruct, but to entertain: we learn to admire that immenſe animated plan, and that beautiful uniformity in the ſyſtem of nature, that out of diſſimilitude produces an admirable and regular gradation, ending in one common and perfect whole; each ſeparate part dependant on the other, inſomuch that the loſs of the whole of the individuals of even the minuteſt inſect, would leave an irreparable chaſm in the chain of animated exiſtence.

Both in their external form, and in their internal ſtructure, nature has been a wiſe and kind parent; for on an attentive examination, a wonderful care will be obſerved in moulding and framing all their various parts, in ſuch a manner as ſhall moſt favourably conduce to their ſeveral ends and intentions. It has been obſerved that the ultimate ends of the exiſtence of animals, appear to be the gratification of their appetites, and the propagation of their ſpecies. As the roads they purſue to theſe ends are diverſified, ſo theſe ſeveral varieties produce the ſtudies of comparative anatomy, and natural hiſtory.

Some quadrupeds appear formed for offence; moſt of them have means of defence; hence ſome, as the lion and tiger tribes, have great ferocity, combined with ſtrength and art: others, as the timorous hare, deer, &c. truſt to the means nature has given them of defence, by eſcaping their enemies in flight; or as the wily fox, eluding them by cunning; others have the means of defence in their great ſtrength, as the horſe. The colour of the partridge, quail, ſnipe, and other game, is ſo ſimilar to the ground, that it is almoſt impoſſible to ſee them; in Ruſſia, the hares are the colour of the ſnow, by which they elude the moſt vigilant eye. They are by their great parent wiſely adapted to the ſurrounding circumſtances, as the climate they inhabit; thus the ſame kind of animal exhibits very different appearances as he is a reſident of different countries; and not only does this take place in the immediate native animals themſelves of any part, but exotics have a ſimilar power of taking on the ſame means of accommodation to exiſting circumſtances; thus not only have the beaſts of Ruſſia long fleecy clothing of wool or hair, but thoſe removed from England become changed in their appearance, and the wool or hair lengthens or thickens, and uſually changes white. This appears effected by ſome conſtitutional ſympathy, and is an effect of that vaſt principle, better felt than underſtood, *i. e.* Life. This ſympathy enables the *materia vitæ coacervata* to remain dormant in the torpid bear during the winter, when he would be unable to get food; and yet preſerves the *materia vitæ diffuſa* entire. There are inſtances in which a change of climate produces effects not underſtood by us, thus the game-cock and the bull-dog, degenerate from their natural courage and ferocity in other countries; and hence Engliſh ſportſmen reſident abroad, uſually ſend home for theſe animals *.

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* The unmanageable ferocity of the bull-dog, and the unconquerable courage of the game-cock, muſt have been acquired qualities, firſt obſerved in a leſſer degree in ſome individuals, and which from hence were cultivated by encouraging theſe habits, and carefully ſelecting ſuch only to breed from, as exhibited the ſtrongeſt marks of this fearleſs oppoſition. In the cock this appears to be more particularly evident, and this acquired diſpoſition is ſomehow or other connected with the air or food of this climate: that this muſt be the caſe we know, as our domeſtic poultry are exotics, brought originally from Perſia or India, it is ſuppoſed by the Phœnicians, who traded to Britain five hundred years before Chriſt. Therefore it is not that a foreign climate is unnatural to them, for they degenerate no where more than in India from whence they originally ſprung. It may be ſaid of the bull-dog, that his form is evidently that of an animal of offence, from the powerful make of his body, the proximity of his inciſive teeth to the centre of motion, by the ſhortneſs of his jaws; and that hence his great ferocity is only correſpondent: this appears a fair concluſion; yet it is inexplicable then why he ſhould degenerate; for the dog is a native of almoſt

In moſt inſtances, the climate, the mode of life, and the exiſting circumſtances, appear to produce theſe changes on the habit, and even on the form; but there are ſome where the form itſelf cauſes the mode of life; hence the minute diviſion of the blood veſſels of the ſloth, and the unfavourable courſe they take for circulation, appear the reaſon for the ſluggiſhneſs of this moſt tardy animal. It muſt be remembered when I ſpeak of the form ſpringing out of the habit, I ſpeak only in the moſt extended point of view. I know it is a matter involved in doubt, and uncertainty; yet on a careful examination of facts, formation will be found in a meaſure ſubſervient to circumſtances, and not circumſtances to formation: was this not the caſe, dead would be proved more important than living matter, or matter with an inferior organization, would be proved more energetic than animal form. ——Man has ſelected from among animals ſuch as are more immediately uſeful, which he has rendered tractable; ſubjugating them by a ſenſe of his power, and engaging their affection by a ſenſe of the bene-

moſt every climate, and has only been ſubjugated by man, for in many countries he ſtill lives wild, and exhibits but little natural ferocity, but congregates like timid animals. It may be farther alleged, that the Dutch pug has nearly all the appearances of the Engliſh bull-dog, yet neither here, or in Norway or Denmark where he is found in the greateſt numbers, does he exhibit any ferocity; on the contrary, he is generally a four-legged buffoon, and rather more, than leſs timid than others.

fits of his protection. By the aſſiſtance of theſe he is enabled to preſerve himſelf from the depredations of thoſe he cannot tame, and likewiſe to attack them, ſo as to render them finally as food, or clothing, ſubſervient to his purpoſes. But it does not appear that this ſelection of animals is altogether ſo complete or extenſive as it might be; I recollect to have read ſomewhere, a very ingenious letter recommending the taming the biſon, the bos camelita of Geſner, and bringing him into domeſtic uſe; at the ſame time producing proofs of its practicability, and demonſtrating its great utility. Another perſon I have heard of, who is rearing a breed of wild geeſe, which bid fair to prove an addition to our domeſtic ſtock; though it may be urged that the preſent tame breed are originally deſcended from theſe, of which the invariable whiteneſs of the rump, let whatever other colour predominate, is adduced as a proof*. I might add, that pheaſants, partridges, and quails, have been reared with all the habits of domeſtication about them; not to add that carp and trout kept in ſtews, will come to a certain ſpot night and morning to be fed, and will at laſt eat out of the hand. There are few animals, but thoſe of the larger predacious kinds, but may be compleatly domeſticated. —— In all quadrupeds, bones form the baſe of the machine: the direction of theſe bones varies, but the end is the ſame; the ſupporting the form of parts, and enabling it to be tranſported from one place to another, for the fulfilment of the various purpoſes nature dictates. The human ſkeleton varies very much from that of quadrupeds, but it is more in the direction of the aſſemblage, than in the individual bones themſelves; which in many inſtances very intimately correſpond: and here again we have reaſon to admire the admirable gradation from the moſt ſimple and inferior quadruped, to the dog, the horſe, the elephant, the ape, and man.——Man walks erect, and for ſocial purpoſes has two of his extremities adapted to the cultivation of all the mechanic arts. His head is round, and his face flat to give intelligence to his appearance; and, as the moſt convenient form, he has a wide cheſt, and his arms are kept apart by means of bones called clavicles, or collar bones.—— The ape appears the firſt remove from man; his form allows him to walk erect, his cheſt is flattened, and he has clavicles; but he uſes his arms as auxiliaries to his legs at times, conſequently they are long in proportion to thoſe of the human, and participate of the nature of the hinder extremities. The thumb of this tribe forms but a very indifferent antagoniſt to the fingers, which is one of the principal varieties in ſtructure from the human, though it is frequently overlooked: in them, the thumb becomes only a fifth finger, and is not by its ſituation oppoſed to them, but is placed lower down; and thus when theſe animals uſe it in oppoſition to the fore finger, as in catching inſects, it is not againſt the point, but againſt the ſide of the ſecond joint: hence it participates of the nature of a foot, and thus forms a connecting link between hands and feet: and therefore, though they are ſufficiently dexterous, they are not ſo much ſo as ourſelves. This tribe have not the nictating membrane coming over the eye, which is another proof of their approximating the human, and it is an illuſtration of the œconomy of nature in never diſtributing her gifts where they could be at all deemed ſuperfluous; the moment ſhe gives extremities reſembling hands, that moment ſhe denies this membrane, becauſe in them it can be diſpenſed with; as the fingers are ſuppoſed equal to the office of removing foreign bodies from the eye. Here likewiſe is a confirmation of the real uſe of this part; here alſo is a proof of the utility of comparative anatomy: by ſtudying its uſes in different animals, and by conſidering it under various points of view, we learn how to appreciate its real merits. By this means we are perfectly aware of the impropriety of practice in thoſe farriers, who cut away the haws as a ſuperfluous part, and herein we ſee that anatomy improves farriery; thus we likewiſe prove that farriery is improving, that it may be farther improved, and that the practice of farriers is not yet the beſt it can be.

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* It is a curious fact, that animals of the ſame claſs are originally of the ſame colour, ſubject only to the variations of climate: but that habits of domeſtication always produce a great variety in colour. In the Iſland of Tinian where our poultry is wild, they are invariably black and yellow, with yellow combs and wattles. Our wild rabbits are grey, our tame ones of very various colours: it appears probable the original colour of the horſe was bay, but domeſtication almoſt always produces an alteration in a few removes from the original animal.

As we proceed farther in the ſcale, we find the fore extremities uſed ſimply in progreſſion; and the whole aſſemblage of bones horizontally inclined. Added to this, in the horſe, ox, and other grazing animals, the neck is long, that they may reach the ground with eaſe: but that the head might not be rendered too heavy by acting on too long a lever, the jaws are lengthened out, by which means likewiſe the brain is kept more in a line with the body, and the determination of blood to it thus prevented; and as another eminent advantage, the organ of ſmelling is thereby much encreaſed. This length in the jaws is effected by the addition of another pair of bones, called inferior maxillaries. In ſuch animals as require great ſtrength in theſe parts, as in the bull-dog, and ſome predacious quadrupeds, this length does not exiſt; but the ſurface of ſmelling is nevertheleſs kept acute, for the frontal ſinuſes are extended higher up, and ſpread more out in theſe inſtances: for in them, was the reſiſtance placed ſo far from the centre of motion, as in the inciſive teeth of long-jawed animals, much of the force would be loſt. In the greyhound, on the contrary, who is to catch his prey while on the eſcape, the jaws are long, by which he is enabled to pick them up while running, and to retain them when caught.

Another very wiſe proviſion is formed for grazing animals, in whom as the conſtant dependant poſition would tire the ſtrongeſt ſet of muſcles, ſo there is a diſtinct apparatus to prevent this; which conſiſts in a very ſtrong ligament, which, contrary to other ligaments, is claſtic, and called *the cervical*, but is very unlike that of the ſame name in the human: by this the head remains towards the ground without fatigue.——For the purpoſes of progreſſion, moſt animals have their extremities in a line with each other, and hence the cheſt is neceſſarily flat; the ribs being flattened, the ſternum made keel-like, and the clavicle or collar bone being wanting *: the ſcapula has likewiſe great motion, which it could not, if confined by a clavicle. The ſkeleton of animals is wiſely adapted to their various habits. In thoſe intended for quick motion it is found to be made up of angles, by which the animal can bound along; the ſpine is very flexible and formed of a great number of pieces, and the ſternum compoſed of ſeveral portions.——The bones are wiſely more conſolidated at birth in many animals than in the human fœtus; particularly in thoſe who have to make exertions as ſoon as born, as the foal, calf, &c.——Carnivorous, and ſuch animals as are forced to ſeek their food by ſtratagem, and ſuch as uſe their anterior extremities in feeding themſelves, have uſually numerous phalanges: a dog would ill-conveniently pick bones with the hoof of a horſe, or even with the feet of a pig; neither could the horſe or aſs ſupport their weights, or keep up their ſpeed, on the ſoft tender ſurface of numerous toes.

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* The cat, ſquirrel, and ſome other animals who uſe their fore paws very dexterouſly, have an imperfect clavicle.

The mode of obtaining food produces endleſs varieties in animals; nor is the food itſelf leſs various, the deſcription of which belongs to natural hiſtory, but the varieties by which different foods become aſſimilated into the conſtitution, belongs to comparative anatomy. The difference in the ſubſtances taken in, has given riſe to a diviſion of animals into *carnivorous*, *granivorous*, and thoſe of a *mixed kind**, enabled to live either on animal or vegetable food. When digeſtion began to be underſtood as a proceſs of ſolution, it was ſuppoſed that the powers of aſſimilation of various animals, were confined to ſuch food as in a ſtate of nature they preferred: but this idea has led phyſicians and veterinarians into error in practice, and phyſiologiſts to form erroneous concluſions. Carnivorous animals can ſubſiſt on vegetable matter. A hawk has been fed on potatoes, which he at laſt ate with pleaſure; and it was the cuſtom in the wars in India, to feed the horſes with offal from the oxen that died or were killed, and this formed the whole of their ſupport in the ſandy track they paſſed through; hence therefore we learn, that in long illneſſes broth might be advantageouſly employed, and afford nutriment to horſes*. Elephants, under the ſame circumſtances, in the eaſtern wars, have been nouriſhed with a very ſmall quantity of rice, but the deficiency made up with nearly a gallon of rack *per diem*; which is a powerful ſpirit diſtilled from rice. Such are the great powers of aſſimilation.

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* It appears that animals might bear a more perfect phyſiological diviſion than this; into *carnivorous*, *granivorous*, *herbivorous*, and *omnivorous*. But there are few perfect inſtances of either diviſion. Nature has kindly extended the reſources of her children, and though they prefer a certain food, they are yet capable of ſupporting life with that which is not altogether natural to them.

Some animals are formed to feed more delicately than others, and ſuffer conſiderable hunger before they will eat unaccuſtomed or dirty food. Others again, as the ſwine, duck, &c. will indiſcriminately eat the clean and the unclean. The cow, ſheep, and ſome other animals, who are deſtined to feed on herbage alone, have their organs of digeſtion much extended, to enable them to extract all the nutritious moleculæ from ſubſtances which contain proportionally leſs powers of ſupport, than either fleſh or grain; and hence their aſſimilating reſervoirs

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[*] In a publiſhed account of theſe wars, a ſingular method of feeding the horſes among the Aſiatics appears: Turf is cut and waſhed, and the roots given to them, and when this fails they boil their offal to rags, and mixing it with butter and a ſmall proportion of grain, they give it in the form of balls; and when in long and forced marches even theſe means are exhauſted, they have recourſe to opium, which damps the appetite, and enables them to bear fatigue.

voirs are extenſive and numerous. The ox, ſheep, goat, and camel have four ſtomachs, and ſeveral of the other herbivorous tribes two or three. And as it was neceſſary that much herbage ſhould be collected, and as it would keep them too long in motion to gather it, and maſticate it as it was gathered, by which means they would not get fat or thrive; ſo they are enabled to collect it firſt haſtily, and then lying down they can maſticate it at their leiſure by a proceſs called *rumination* or *chewing the cud.* The ſame wiſe proviſion is made for birds, who, from the numberleſs enemies they have to encounter, and the extent of ſpace they paſs through to collect their food; had they to ſtop to maſticate it, muſt have ever been in danger of ſurpriſe, and never have been able to ſatisfy themſelves; but by the gizzard performing the office of maſtication, as the food is paſſed into it from the crop, ſo they have it only to ſeek, to pick up, and make an immediate removal in ſearch of more. The cow, goat, ſheep, camel, deer, and ſome other animals have no upper inciſive teeth, but they collect a bundle of herbage which they wrap round the tongue and cut it off with the under teeth. This is formed into a bolus, and mixed with a ſaliva, in which ſtate, without chewing, it is carried into the paunch or firſt ſtomach. The tongue is furniſhed with papillæ or little bodies pointed backwards, which give the rough ſenſation when a cat licks the hand; theſe bodies, aſſiſted by the ridges of the upper part of the mouth, prevent the bolus falling back; for the action of the molar muſcles in theſe animals is ſmall. It is thus carried into the firſt of the four ſtomachs. This is called the *paunch* or *maw*, and by the French panſe. It is capable of containing a great quantity, extending, when full, from the diaphragm to the haunch bone: thus in *hoved* cattle, which is a diſtention of this part, a puncture is made between the haunch bone and laſt ribs. The paunch has a number of projecting proceſſes to extend its ſurface, and to aſſiſt in the offices of this cavity; which is probably ſomething more than merely containing the food. When the animal has filled this as much as is neceſſary, it lies down*, and now its action becomes more evident, for inſtead of ſimply receiving, it takes on the power of ſeparating a part from the reſt,

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* All animals, nearly, are obſerved, when they have fed heartily, to lie down and feel a diſpoſition to ſleep. Two reaſons appear to produce this: The ſtomach is now in a ſtate of capacity, and hence more blood is ſent to it, the circulation becomes thus leſſened in other parts, and as the capacity of the ſtomach encreaſes, that of other parts leſſens, and laſſitude occurs; but perhaps a ſtronger reaſon may ariſe from the preſſure a diſtended ſtomach makes upon the diaphragm, by which means as reſpiration is impeded, ſo the right ſide of the heart becomes diſtended, preventing the free return of blood from the head, which thus preſſing on the brain produces a diſpoſition to ſleep. Hence the advantages of analogy; for we thus learn, that ſleep is highly favourable to digeſtion, and likewiſe that ſleeping after meals ſo far from being prejudicial is ſalutary. But analogy muſt not carry us too far; there are ſome animals, as thoſe formed for ſpeed, whoſe ſtomachs not being formed for ſo much diſtention, do not feel this diſpoſition to ſleep in equal degree; horſes ſeldom ſleep after meals, for in them digeſtion is carried on, as much

much nearly in the inteſtines as in the ſtomach; and hence energy and motion are in ſome degree requiſite to the end nature requires, which is a haſty paſſage of the food through the ſtomach, that as he is conſtantly eating, more might be taken in. But reaſoning from other animals, it has been uſual to ſhut up race-horſes without light, that they might feed quickly and lie down, whereby it has been ſuppoſed digeſtion would be accelerated; but from the reaſons mentioned, ſleep is not ſo neceſſary nor ſo natural after meals to horſes, as to animals with large ſtomachs, and who ruminate. Man is intended by providence likewiſe to live on mixed food that contains a conſiderable portion of nutriment, and hence living according to nature his ſtomach would not be much diſtended; but culinary arts having given falſe appetites, ſo an unnatural diſtention takes place, and the diſpoſition to ſleep is felt. From what has been ſaid, it may be gathered therefore how far ſleeping after meals is unwholeſome in ourſelves. In a very fat perſon it is evident any farther accumulation ought to be prevented; ſuch perſons ſhould therefore rather exerciſe themſelves after eating. Lean and emaciated people, for the ſame reaſons, ſhould reſt after their food. This mode of reaſoning ſolves the difficulty with regard to the propriety or impropriety of ſuppers. When a hearty dinner has been made at a late hour, the ſtomach by ſupper time has not gained a ſtate of capacity; hence eating then, as the conſtitution cannot aſſimilate it, ſo the food taken in becomes a foreign body, and occaſions the ſame uneaſineſs to the ſyſtem with the introduction of any unnatural ſubſtance, and hence *incubus* or *night mare* and frightful dreams, with every ſymptom of indigeſtion or *dyſpepſia*. But if the ſtomach is in a ſtate of capacity, no ill effects follow. Fat perſons ſhould not indulge in ſuppers, nor apoplectic perſons: both theſe ſhould habituate themſelves to ſleep on their right ſide, which is more favourable to the paſſing reſt, and by the action of the œſophagus, ſaid to ariſe from its ſpiral fibres, returning this detached portion into the mouth, where it undergoes a ſecond and complete maſtication. Here likewiſe we may notice a wiſe formation in the teeth of herbivorous and gramenivorous animals. Their grinders are broad, flat, and rough, the better to grind the food into a pulp; the roughneſs is occaſioned by perpendicular plates of enamel, interpoſed between ſtrata of common bone; by which, as the enamel wears ſlowly, there are always ridges leaving a rough grinding ſurface, ſimilar to the peckings in a millſtone. *(See this more exemplified in the deſcription of the teeth of the horſe.)* In carnivorous animals the form differs much, their teeth have pointed proceſſes riſing out of them, evidently intended for tearing the food more than grinding it. It may be remarked likewiſe, that in all animals the teeth that are to perform moſt, as the grinders, are placed neareſt the centre of motion, that is, fartheſt in the mouth,

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paſſing of the food through the ſtomach into the duodenum. Sleep may perhaps be more favourable to the accumulation of adeps or fat than to fleſh. Thus pigs who ſleep much fatten faſt, and when they become ſo big as to be unable to ſtand, they accumulate fat aſtoniſhingly. Oxen do the ſame when they are ſtalled; but in both it appears more animal oil than muſcular fibre has been gained. Stable-keepers do the ſame with freſh horſes, and trainers with race-horſes; but all theſe ſhould remember, there is a very wide difference between an accumulation of fat, and growing luſty by nutriment combined with exerciſe.

where they have moſt force. The food having undergone a ſecond and complete maſtication, is paſſed, it is ſaid, into the ſecond ſtomach by the œſophagus, which opens indifferently into either. This ſecond ſtomach is called the *honey-comb* from its internal appearance, which is ſufficiently known in tripe; it is likewiſe called *bonnet* or *kingſhood*, and is ſituated between the paunch and tendinous part of the diaphragm. The uſe of this is in ſome meaſure doubtful. Dr. Monro deſcribes it as receiving the food from the œſophagus, after the ſecond maſtication, as do ſeveral other Engliſh authors; while Buffon and moſt of the French anatomiſts, ſuppoſe that it contains part of the unmaſticated food, and aſſiſts in the ſeparation of the bolus for regurgitation*. It is found to contain a great quantity of macerating liquor, and therefore its probable uſe is to ſecrete this, and to add it to the food while in the paunch, and that the re-maſticated bolus paſſes at once into the third ſtomach, as well as the drink. The *manyplies*, or third ſtomach, is ſo called from its numerous folds, which, as well as the pentagonal cells of the laſt, are only to encreaſe its ſurface. It is by the French named *feuillet*, or leafy, from theſe folds, and is ſmaller than either of the former. It here undergoes ſome farther change, or becomes more completely macerated previous to its paſſing into the fourth. This forms the true digeſting ſtomach, and to this the others muſt be conſidered as appendages only. It is called by us the *red*, by the French *caillette*; in this ſtomach the pultaceous maſs undergoes a perfect ſolution by means of the gaſtric juice, which only exiſts in this. Hence it is this ſtomach only produces rennet, which perſons making cheeſe are well acquainted with; for this rennet is nothing more than the acid gaſtric juice in the fourth ſtomach of a calf, which has a power of coagulating milk and other ſubſtances.

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* "La nature a donné à la panſe et au *bonnet* la faculté de "repaſſer l'œſophage les aliments groſſiers qu' ils renferment."

Medicine de betes a laine.

"Cette operation ſe fait par un movement réglé, tres-différent "du movement convulſif du vomiſſement; c'eſt une ſort de de-"glutition renverſée, qui ne peut ſe faire que par des organes par-"ticuliers aux animaux ruminants. Les principal de ces organes "eſt le viſcere que l'on appelle le *bonnet*, que l'on avoit regardé "jusqu' à préſent comme le ſecond eſtomach de ces animaux; "cependant il ne fait aucune fonction d'eſtomach."

M. Daubenton.

This ingenius author farther ſuppoſes, that the principal uſe of this viſcus is to form a large quantity of fluid to mix with the aliment, and that the reſervoir of the chamois, the dromedary, and camel, ſituated in the fauces, is for a ſimilar purpoſe. But it is more probable this is deſtined to contain water to moiſten the fauces in their long abſtinence.

This peculiar mode of digeſtion called *rumination*, has always been conſidered a ſource of admiration to the curious, and an object of reſearch to the phyſiologiſt; but the French appear to have entered into it more minutely than ourſelves, though it is a proceſs that tends to throw much light on the œconomy of the ſtomach. Peyer, a celebrated French anatomiſt, deſcribed this action very accurately more than a century ago, but like others who have adopted a favourite ſyſtem, he purſues it to an extravagant length; for he ſuppoſes that almoſt all animals ruminate. Among the inſect tribes, he ſays, ſeveral do it, and it is common with the beetle, worms, and crickets. Among fiſhes, he adduces the porpoiſe as an inſtance, and the hare, wolf, and ſeveral others among quadrupeds. All birds are with him ſubject to this proceſs; nor is even man exempt, which he endeavours to prove by quoting Rhodius, who ſpeaks of a monk, who could regurgitate at pleaſure, and who re-maſticated with delight.

But all the quadrupeds that feed on vegetable matter have not this faculty of rumination, nor even all of thoſe who are more immediately herbivorous. The horſe, the aſs, dogs, ſwine, hares, rabbits, and guinea-pigs, have but one ſtomach. There is a claſs of beaſts that may be more ſtrictly called granivorous, as evidently being formed with organs peculiarly fitted for the aſſimilation of grain; ſuch are the horſe, aſs, rat, and mouſe. Theſe appear to form a connecting link not only between ruminant and other animals, but between the triturating medium of a gizzard, and the ſolvent power of a ſimple membranous ſtomach. Though theſe kind of animals can live on eſculent plants, yet they thrive beſt on farinaceous matter; a horſe has not organs fitted to take up much nutriment from herbage alone, hence he is not capable of ſupporting much fatigue under this food, and he is forced to eat double the quantity of gramineous matter that ſatisfies an ox, to fit him for the common purpoſes of his exiſtence. As an animal intended for ſpeed, his ſtomach is ſingle and ſmall, and he is hence, when feeding on herbage alone, obliged to be conſtantly eating, and the ſtomach is conſtantly paſſing its contents into the inteſtines, where digeſtion is completed. In this claſs of animals therefore, it isevident that grain muſt be more adapted to their wants, as containing more organical moleculæ or nutritive matter in a given bulk*. And that their powers of aſſimilation of this ſubſtance is great, and that it becomes naturally a part of their ſupport, is evident from viewing the ſtomach, which in the horſe, aſs, rat, and mouſe, has one half of its ſurface covered by a cuticular coat, ſerving to defend it from the action of the hard bodies of grain upon it, and ſerving probably to produce a farther maſtication upon the food taken in. This therefore may be conſidered as a continuance of the firſt ſtomachs of ruminating beaſts, and of the cuticular covering of the gizzard in birds. This ſubject will be conſidered more at length in treating on digeſtion.

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* The *farina* of plants ſeems more particularly fitted for the ſupport of animal life, which is the reaſon that all the ſpecies of corn yield a greater nouriſhment than ſucculent herbs; and in the degree that any vegetable is farinaceous, it may in general be accounted nutritive to moſt of the animal forms aſſimilating nutriment from vegetables. This farina or flour is compoſed of amylaceous matter or ſtarch, animal gluten, and ſaccharine particles, either of which principles are capable of ſupporting life ſimply; but beſt in combination: yet in ſome inſtances animals are found to thrive well when one predominates, as oxen and horſes fatten on carrots, in which there is much ſugar; but horſes do not ſtrengthen on them; likewiſe on potatoes in which ſtarch abounds, they will fatten; but they thrive, fatten, and ſtrengthen moſt readily on corn, in which the whole of theſe principles abound; but the vegeto-animal gluten is ſuperabundant. Wheat contains the greateſt quantity of this matter, that appears to have all the animal properties, and hence is choſen by Europeans in general as their food. Potatoes as having been proved to poſſeſs much of this in combination with amylaceous matter, are now known to be highly nutritive; a circumſtance that though it had the ſanction of long experience, was doubted by ſome.

The ſtomachs of the carnivorous kinds, as a general rule, are ſmaller, but more muſcular; for here there is ſtill greater nouriſhment in a leſs bulk; but which, as it was neceſſary it ſhould be minutely broken down and diſſolved, ſo the ſtomach was given ſtrong and muſcular; and this was the more neceſſary, as in theſe animals the teeth are more fitted for tearing than grinding; and their habits of voracity are ſuch that they maſticate but little, and uſually ſwallow it whole. The inteſtines of the carnivorous and gramenivorous animals differ much; in the latter they are very long and membranous, and the diſtinction into large and ſmall is evident and well marked. In the ſtrictly granivorous, as the horſe, aſs, &c. this is particularly the caſe; the cæcum and colon are very large, and take up a great portion of the abdomen. In the herbivorous, the alimentary track is long, but the cæcum and colon do not become ſo extended as in the former, nor is there that neceſſity, in as much as the food has by its continuance in the other ſtomachs become ſo much digiſted, that what remains to be done is ſimply a ſeparation of the nutritious from the fœculent portion; but in the horſe, part of the maceration and ſolution is probably continued in the inteſtines, or at leaſt its continuance in this canal is evinced to be neceſſary. It may be obſerved that the chymous maſs is apparently more broken down in the ſtomach of the cow than even in the inteſtines of the horſe, and hence ariſes the difference in the dung of the one animal and the other. While that of the horſe retains much of its original principles, and is thus capable of being applied to many uſeful purpoſes, that of the cow is almoſt entirely decompoſed, and retains little of its former properties, being wholly fœculent, and thus unfitted to form manure. In granivorous animals the cæcum and colon are not only large, but have cells for the detention of the food a conſiderable length of time.

Man appears to hold a middle claſs between the two, and is wiſely adapted to exiſting circumſtances; his ſtomach is more membranous than that of carnivorous, and leſs ſo than that, or thoſe of herbivorous and granivorous animals. The inteſtines are not ſo long, and the cæcum inſtead of being a large receptacle, very properly is called appendix vermiformis, and appears rather to be formed like the human male nipples, only to keep up that vaſt connection and uniformity obſerved throughout nature. Yet the human inteſtines are ſufficiently long and large to evince that he can be ſupported by vegetable food alone, and this we find in ſome inſtances is really the caſe, as in ſome Indian tribes. Man even appears by his ſtomach and inteſtines to be more formed for vegetable than animal nutriment; yet his teeth are evidently adapted for tearing fleſh, his grinders are of the middle claſs, but lean rather towards the carnivorous, and he has two teeth above and below of the true canine kind*. Hence we ſee the folly of thoſe tribes who hold

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* It appears ſurpriſing, that men of learning and genius ſhould waſte ſo much valuable time in wild and extravagant theory. Some of the greateſt philoſophers have endeavoured to prove that man was not by nature deſtined to eat animal food. They endeavour to prove it even morally wrong; but was it to our purpoſe, it would not be difficult to diſprove this. Providence not only gave us dominion over animals for this expreſs purpoſe, but the refraining from them, would occaſion the moſt ſerious inconveniences. But when they attempt to argue from the form of man, as his teeth, the preſence of a cæcum and a conſiderable colon, they fail altogether in eſtabliſhing their proof. The teeth even lean to the carnivorous kind, the cæcum is but an appendage, and the colon is evidently of the mixed kind; add to which the power in the human alimentary canal, of aſſimilating fleſh to a perfect ſupply of the wants of the ſyſtem without the aid of any vegetable matter, is an irrefragable proof that man is naturally omnivorous.

The cuſtom of all nations, and of all times, might likewiſe be pleaded; for the few of the Pythagoreans who believe in tranſmigration are not to be admitted, nor the Bramins, who, from ſimilar hold it improper to eat any thing that has life, who by this means evidently counteract the intentions of nature.

Before agriculture is cultivated in a country, man chiefly ſubſiſts on fiſh or wild animals; but when cultivation produces the fruits of the earth, he lives indiſcriminately on either.

The inteſtines of carnivorous animals are ſmall and muſcular; but little ſpace is required for what has but little bulk; but ſtrength is neceſſary to effect the paſſage and expulſion of the fœculent matter, which aſſumes a hardened form. In the dog the colon is of nearly a ſimilar ſize with the ſmall inteſtines, and does not paſs around the abdomen as in the horſe, but ends at once in the rectum: but in all, the duodenum is ſo placed as to give a diſadvantageous courſe to the aliment, that the bile and pancreatic juice might be mixed with the chymous maſs before it enters the jejunum and ileum to be taken up by the lacteals; by which it appears ſome particular effect is produced by theſe juices upon this maſs, fitting it for ſeparating the chyle; and not ſimply being the purge to the inteſtines. The whole of the viſcera diſplay a peculiarity of

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ſimilar reaſons abſtain from whatever has animal life. Even had the erroneous aſſertions of the above philoſophers been admitted, it may be proved, there are ſome animals, as the opoſſum, which have a conſiderable colon and cæcum, and yet feed on fleſh. The hedge-hog who is granivorous, has neither colon or cæcum it is ſaid. The hog likewiſe forms a notorious inſtance.

conformation in animals intended for ſpeed, by which they permit of rapid motion without detriment to their ſtructure or functions. In the taper body of the dog, the ſtomach lies almoſt longitudinally, and the pancreas and ſpleen follow in ſome degree a ſimilar direction. In theſe animals the liver and lungs are divided into numerous lobes. The kidneys of different brutes vary much in appearance, though but little in function and œconomy. In almoſt all fœtal ſubjects, and in the infant, they are lobulated, or compoſed of ſeveral portions; and not as in thoſe of ſheep blended into one maſs. In the ox and bear they remain thus in the adult. In the dog the papillæ do not ſend out the ſeveral tubuli urineferi, but are all united and hang down in the middle of the pelvis, and form a kind of ſeptum.

The bladder of carnivorous animals is ſmall and muſcular, that the acrid urine might be early expelled; in man its ſhape is more circular, in beaſts nearly pyriform. The organs of generation afford ſeveral varieties: in thoſe who have a ſhort ſcrotum with the teſticles not pendulous, the veſiculæ ſeminales are uſually wanting. The dog forms an inſtance of this, and to the want of theſe which have been ſuppoſed the ſeminal receptacles, has been attributed the great length of time he is in copulating. The penis of this animal is likewiſe peculiarly formed: there are corpora cavernoſa and a glans, but between theſe there is a triangular bone through which the urethra paſſes.

The female organs are ſimilar to thoſe of other multiparous quadrupeds, except that the vagina is proved to be more cavernous, and hence diſtends more during the venereal orgaſm ; this detains the penis of the dog ſo long before it relaxes, that the animal becomes tired, and turns from her, which muſt naturally twiſt the penis, and would do ſo to the urethra, but for this triangular bone ; by which the ſemen which is thus long in coming would be ſtopped. When it has been poured into the vagina, the orgaſm being over, the parts collapſe. This is the mode in which it has been uſual to conſider this act in the dog, and the uſe of this peculiar formation has been thus accounted for by Dr.Monro; but to me there have ever appeared ſtrong objections to this explanation. Mr. Hunter has not only conjectured, but even demonſtrated, that the ſemen never enters the veſiculæ ſeminales ; in the horſe, I am convinced it does not, and I have taken pains to ſhew this, in the plate of the viſcera of that animal: conſequently it appears more than probable, the want of theſe cannot retard the act. It likewiſe ſeems contrary to the general cuſtom of nature, that the venereal pleaſure ſhould be over before the ſemen is emitted. And if theſe veſicles are ſimply the reſervoirs, whence is it that a ſecond copulation and emiſſion can take place in a few minutes in the human and other animals; when it is evident that an ordinary emiſſion is equal to the capacity of theſe organs.

Quadrupeds are uſually *viviparous*, that is, they bring forth their young compleatly evolved. The number of young, and the periods of geſtation, are influenced by the ſize of the animals. The elephant produces one only, and goes with young two years. The mare, aſs, and cow, produce uſually but one, and are nearly twelve months bringing forth: had the increaſe of theſe larger animals been equal to that of the ſmaller, the fruits of the earth would not have been ſufficient for their ſupport; nor the united efforts of mankind equal to their dominion. Theſe animals that in general bring forth one only at a birth are called *uniparous*, while ſwine, bitches, rabbits, and moſt of the leſſer animals, produce ſeveral at a time, and are hence called *multiparous*. In the multiparous animals the uterus bifurcates into two cornua, in which the fœtuſes are lodged. The uterus of the mare has likewiſe two cornua: in the cow there are cornua likewiſe. In the latter, there are very numerous placentulæ, beſides the general adherence; but which is not ſo extenſive as that of the mare. Theſe placentulæ were miſtaken by Hippocrates, who reaſoning from analogy only, ſuppoſed the human fœtus ſucked in utero. In the uniparous claſs, the fœtus is lodged in the uterus, and not in the cornua.

The kangaroo is an animal that exhibits ſome ſtriking peculiarities in its mode of generation. Mr. Home, in the ſecond Part of the Philoſophical Tranſactions for 1795, has given an accurate account of this at length. It appears that the male has a *penis intrans* long and pointed. The female has a vagina about an inch and half in length, dividing into two canals, between which is the meatus urinarius; theſe canals terminate laterally in the two angles of the fundus uteri; the uterus itſelf is thin and membranous, and ſituated between theſe canals, diminiſhing in breadth from the fundus to the neck. The ovaria and fimbriæ reſemble thoſe of other quadrupeds; but the uterus and vagina differ much, and appear to form a connecting medium between the viviparous and oviparous animals. The female has two mammæ, each of which has two nipples; and are ſituated between two moveable bones connected with the os pubis: anteriorly they are covered by a falſe belly or bag formed of the ſkin. It appears that the young kangaroo is not nouriſhed in the uterus of the mother, as in viviparous animals; but that it paſſes from it through the vagina into the falſe belly, which has peculiar muſcles to draw it near the vulva or ſheath of the preſent. At what time after impregnation this takes place, has not been aſcertained; but a fœtus has been found in this falſe belly attached to the nipple, when leſs than an inch in length, and only twenty-one grains in weight. In another caſe it weighed thirty-one grains, and was an inch and quarter long. It was obſerved at theſe periods the fœtuſes had no navelſtring, nor any appearance of ever having had one. The fore parts were much evolved to enable it to exiſt in this peculiar mode: the mouth was a round hole and held the point of the nipple, and the fore paws compared with the reſt of the body were ſtrong and large. Thus this animal appears, while in the true womb, to exiſt only in an oviparous ſtate; but when paſſed into the falſe belly, it becomes a perfect ſpecies of the mammalia claſs; and may thus be regarded as a connecting medium between the oviparous and viviparous animals. The kangaroo is uniparous, but it frequently depoſits another young one in the falſe belly, before it has diſcarded the former entirely; for while the new fœtus is atached to the nipple, it will permit the former to put its head into the falſe belly to ſuck, or even to ſeek refuge there in caſe of danger.

The mode of ſupplying the young with nouriſhment, differs in ſome degree in the uniparous, and in the multiparous tribes. In the former, the mammæ are ſituated between the hind legs, as moſt convenient and leaſt expoſed to danger: but in the latter, they are ſpread along the thorax and abdomen; and the parent uſually lies down to give her young ſuck. This ſerves to throw great light on ſecretion; ſhewing it to be an act of the veſſels of any part having the capacity, and not at all confined to ſituation.

Reſpiration, and the phenomena of circulation, produce ſome varieties in quadrupeds; and as a matter of compariſon between them and the human, reſpiration is very differently conducted; for in man the form of the cheſt admits of much motion in the ribs, by which its capacity becomes much enlarged; but in brutes the ſize of the thorax is principally augmented by the diaphragm, which in them is very moveable. The heart is formed in ſome with two, in others with three, but in all the more perfect quadrupeds with four cavities, forming a complete double circulation; but the diſtribution of the veſſels producing this, varies in different ſubjects. In the human, the aorta gives off ſoon after its origin the right ſubclavian, left ſubclavian, and left carotid arteries; the right carotid is furniſhed from the right ſubclavian; ſo that there is, properly ſpeaking, no aſcending aorta in the human: and it was probably from diſſecting horſes and oxen, that the antients firſt gave theſe terms to the aggregate of theſe veſſels; and which error we have continued. Neither in the dog is there any aſcending aorta, for here the two carotids and the right axillary artery ariſe by one trunk, and the left axillary by another. Our diſpoſition to the uſe of the right arm in preference to the left, has been accounted for on the principle of their being, by this formation, leſs reſiſtence to the blood in the united trunks of the carotid and ſubclavian, than in the left ſubclavian; and hence the right arm receiving more blood was ſtronger: and it was thought where perſons were ambidexter, there was ſome ſpeciality of conformation. But as this diſpoſition is found in almoſt every animal, and where the diſtribution of the veſſels is not particularly favourable to the right extremity; ſo it perhaps requires that we look farther for the ſolution of this phenomenon.

The brain in quadrupeds is an organ that exhibits fewer varieties than almoſt any other. It nevertheleſs in the higher orders is more complex in its ſtructure, though this has been ſuppoſed to be rather the effect of the growth of parts as relative to each other, than as peculiarities influencing its functions. The ſize of this organ varies much; and as it is ſuppoſed to be the ſeat of inſtinct, intellect, and conſciouſneſs, ſo its various proportions have been carefully marked by phyſiologiſts *. Its ſize has

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* *Le cerveau* a differentes proportions dans divers animaux. Il n'eſt pas grand dans les oiſeaux à proportion du corps: cette proportion eſt beaucoup plus petite dans le bœuf et dans le cheval; le ſinge, animal ruſe et adroit, a un grand *cerveau*. Les animaux ruminans en ont moins que l'homme, mais plus que les autres brutes; comme on le voit en comparant les cerveaux de la chevre, de l'élan, avec ceux du lion et du linx. Il eſt petit dans les animaux qui ſe battent; car ils ont des muſcles temporaux fort epais, qui étréciſſent leur crâne en comprimant, ſous la forme d'un plan incliné et cave, les côtés que nous avon ronds et ſaillans en dehors. On a donc raiſon de dire qu'un petit cerveau eſt la marque

has been uſually conſidered as relative to the intellectual attainments of the animal, or as he is more or leſs rational. In man the rational principle is ſtrong, but the organs of ſenſe weak; hence the human brain is proportionably larger than that of any other animal. It is even ſaid that the proportions are not the ſame throughout mankind, and it has been proved on a very numerous compariſon, that the European ſkull was larger than that of the African, and that the ſize of the brain was in the natives of Europe as one fiftieth part of the whole ſyſtem; while in the [§]African it was as one to fifty-four. Brutes have the rational principle leſs ſtrong, but

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marque non de l'imbécilité mais de la férocité. Ce viſcére eſt beaucoup plûs petit dans les poiſſons que dans les quadrupedes: le requin, qui peſe trois cents livres, n'a pas trois onces de cervelle: elle eſt copieuſe dan les eſpéces qui paroiſſent plus ruſée, telle que veau marin. C'eſt ſi peau de choſe dans les inſectes, qu'on ne peut ſavoir ce qui fait cerveau: on ne voit que la moelle de l'épine ſeule, qui paroît dégénérer uniquement dans les nerfs optiques: dans l'éphemere, l'eſcarbot, l'abeille, le cerveau n'eſt au plus qu'une petite particule pas plus groſſe qu'un ganglion de la moelle épiniere, comme dans le chenille, dans l'hermite, dans les vers á ſoie. *L'homme*, le plus prudent des animaux, a le plus grand cerveau: enſuite les animaux, a le plus grand cerveau; enſuite les animaux que l'homme peut inſtruire, et enfin ceux qui ont trés peu d'idée, et des actions de la plus grande ſimplicité, ont le plus petit cerveau. Mais eſt-on robuſte, en égard à la quantité du cervelet? Cela eſt vraiſemblable: l'expérience nous manque cependant ici; ce qu'il y a de certain, c'eſt que l'homme, fait pour avoir tant d'idée, n'eut pu les contenir dans un plus petit cerveau. *Dict. Raiſonné, tome ſecond.*

the organs of ſenſe very acute; hence in them the brain is ſmall in proportion to the human. This diſproportion appears neceſſary, when we conſider animals are denied that ſhare of conſciouſneſs that falls to the lot of man: but that they might not outwardly ſuffer from this, their inſtinctive powers are very great, and the organs of ſenſe highly active. Were they equally rational, they would be equally wily, and thus elude the dominion of man; and by their great ſtrength ſoon ſubject him to their power: whereas were they not more inſtinctive than him, they muſt ſoon periſh. On the contrary, man is deſtined to the exerciſe of his great faculties and powers of thought; and that he may be ſtimulated to this, his organs of ſenſe are weak; whereby he feels the greater neceſſity to make up the deficiency by his intellectual exertions. Add to this that it forms one of his principal advantages; had man the accurate noſe of a dog, he would be rendered incapable of living in a city; and was his hearing equally acute, he could never ſleep, for diſturbance, or reſt, from fear. The brain of man we have noticed as being ſaid to be one fiftieth of the whole ſyſtem *; but this muſt not be regarded as definite: a perſon may gain or loſe much in their bulk, but the brain remain nearly the ſame. Mr. Bell conſiders the proportion as one to forty; but Baron Haller found that in a boy it bore a proportion of one to twenty-two, and in an adult as one to thirty-five.—

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* See Saumarez's Phyſiology, vol i. 163.

But certainly much may be gained from an attention to the various proportions of this organ, whoſe magnitude always appears relative to the approach to rationality in the animal. The monkey has a larger brain than a dog. The horſe, elephant, and dog, have each a very conſiderable brain. As we deſcend in the ſcale, the diſproportion becomes much greater. The brain of fiſhes is very ſmall in proportion to their bulk; that of the ſhark does not weigh more than three ounces, though the weight of the body is three hundred pounds. Dr. Rowley, in his *Schola Medicinæ Univerſalis Nova*, has given the relative magnitude of the brain in different animals with reſpect to the ſyſtem, collected from different authors; to which I would refer the reader, if he wiſhes farther information on this curious ſubject.

From the very great acuteneſs in the organs of ſenſe in brutes, we ſhould be led to expect ſome varieties from the human, and from each other, as regarding their different habits and manners; and upon a review of this ſubject we ſhall not find ourſelves miſtaken. The eye is admirably adapted to the various purpoſes for which it is intended. In inſects, the eyes are moved by means of the head; but in quadrupeds there are two only, which are moved by means of muſcles, and placed in the moſt advantageous manner: hence in hares and rabbits, which are timid animals, and whoſe means of defence are few, and moſtly conſiſt in flight, they are ſo placed as to take in nearly the whole ſphere, whereby they are enabled to look back on their purſuers without altering their poſition: on the contrary in the wolf, the dog, and the fox, whoſe nature it is to purſue them, the eyes are placed more forward than laterally, or poſteriorly. As quadrupeds have not hands to defend theſe organs, they have a ſeventh muſcle which is denied to man, by which the eye is drawn within the ſocket on the approach of danger. This retractor muſcle likewiſe influences a cartilaginous and membranous guard, which paſſes over the eye when the globe is drawn in. In man and in the ape tribe, who have hands, this nictating membrane is denied.

The large axis of the eye, in ſome animals, is placed in one direction, in others in another. In horſes, oxen, ſheep, and others who graze, it is tranverſe, by which they are enabled to take in a larger field in the line of direction with their food. In cats, the ſection is from above downwards, as beſt adapted to ſeeing their prey: and as their viſion is indiſtinct in a ſtrong light, they are enabled by the action of the iris to ſhut out nearly the whole of the rays. Beaſts have likewiſe a ſubſtance expanded over the poſterior part of the choroid coat, called *tapetum*, by which the rays paſſing through the retina upon this expanſion are reflected back, and thus ſtriking the retina twice, conſequently produce a greater effect. The lighter the colour of this tapetum, conſequently the more rays will be reflected, and the viſion rendered diſtinct in an obſcure light in this proportion: thus animals who prowl for their prey at night have it nearly white. The redneſs that appears in theſe caſes, ariſes from the tranſparency of the retina, permitting the vaſcularity of the parts beneath to ſhine through. That luminous appearance likewiſe that is ſeen in the eyes of cats in an obſcure light, ariſes from their capability of collecting all the rays by the expanſion of the iris, and by the tapetum of reflecting them back again in this concentrated ſtate; which thus gives us the idea of fire. It has been thought from this appearance taking place almoſt in the dark, that there was a power in the eye of the cat to generate light: but it is now proved, that this appearance never occurs under a total privation of light, as in a perfectly dark room, but only when there is a very obſcure one. Animals, who by their habits have to ſeek their prey nocturnally, can ſee beſt at that time; nevertheleſs all quadrupeds can diſtinguiſh objects at this time better than man; and thus it is, that it is found ſafer to ſubmit to your horſe in a dark evening, than to truſt to your own guidance.

The colour of the pigment at the bottom of the eye, is generally the ſame as the rete mucoſum of the ſkin of the animal; hence very fair people have uſually light eyes. In ſome perſons, this takes place to ſuch a degree as to put them in the ſame ſituation with the animals we have been deſcribing. They can ſee extremely well at twilight; but not being able to ſufficiently contract the iris to ſhut out nearly the whole of the rays, they ſee indiſtinctly in the day, and when the ſun ſhines are nearly blind. Theſe perſons are called *nyctalops*. A whole family are in this ſituation at Kelveden in Eſſex, of which the beautiful girl ſhewn at Brooks's, is a member. It is peculiar that not only the colour of the pigment and rete mucoſum ſhould correſpond, but the hair likewiſe; which in theſe perſons is white, and likewiſe in ferrets, and ſome rabbits, in whom the ſame appearance predominates.

In the grazing and ruminating animals, the colour of the bottom of the eye correſponds with the ſurrounding objects, by which nearly all the rays are excluded or abſorbed, but ſuch as are reflected from theſe objects; thus in the ox it is green, and in the horſe grey.

The ſenſe of ſmelling is very acute in quadrupeds, particularly in the predacious and carnivorous kinds. The olfactory nerves are hollow and very large, and ſpread very plentifully over the pituitary membrane, which is a fine vaſcular expanſion rendered very extenſive by the convolutions of the turbinated bones, and the great ſize of the frontal ſinuſes, and ethmoidal cells, over the whole of which it is ſpread. The entrance to this extenſive ſurface is wiſely by a ſmall opening, by which the air acts more ſtrongly on the organ. In man, ſmelling acutely is not ſo neceſſary, as he has judgment and experience to guide him.——Hearing is likewiſe very acute in brutes, in ſome it is very remarkably ſo. The form of the internal ear varies but little, but the external ear is beautifully and wiſely adapted to the circumſtances appropriate to the animal; but in all it is formed to take in numerous ſonorous waves. For ſimilar reaſons to thoſe before deſcribed, this ſenſe is leſs perfect in man. Beaſts feel by their lips and feet, which are uſually very ſenſible; they have likewiſe very large cutaneous nerves over the whole ſkin, by which they are ſenſible to the approach of any offending matter. Nature has likewiſe given ſome of them a muſcular expanſion, or fleſhy pannicle, by which they can ſhake and wrinkle the ſkin at pleaſure, thereby removing duſt, or preventing the acceſs of inſects, and thus making up for the want of hands. Nature, who makes nothing in vain, has denied this expanſion to man. Some, as the porcine tribe, are without it; their long briſtly hair, and thick ſkin, are a ſufficient defence to them.

Taſte is only a modification of touch; it exiſts in the tongue, palate, and fauces. In ſome animals, as the ant bear, the tongue performs the office of a hand, in bringing the food to the mouth; it does the ſame in the wood-pecker, camelion, and in ſome ſhell-fiſh. In the camel and dromedary, the fauces contain an apparatus for moiſtening them, in the long marches they are forced to make without drinking.

Some quadrupeds, as the dog, fox, and wolf, do not ſenſibly perſpire by the ſkin, but the perſpirable matter paſſes off by the mouth. This throws great light on the phenomena of reſpiration and perſpiration, and ſhews that the conſtitution is freed from a ſimilar matter in both theſe proceſſes. It is not a little curious that the ſpontaneous generation of hydrophobia, ſhould be confined to this kind of animal.

Animals and vegetables having the ſtructure we have pointed out, and the functions we have mentioned, have a common tendency to decay, and the common deſtiny of death is inevitable; but this is variouſly protracted in the different living forms. Some vegetables, as the oak, grow and flouriſh for ſeveral centuries; others riſe with the ſpring and die with the autumn. The more complex and perfect ſyſtems are more liable to premature death, and which is likewiſe haſtened by a life of art; hence we find the greateſt inſtances of longevity in thoſe countries where luxury and refinement have made little progreſs. The aſtoniſhing longevity of the antediluvians has always been a matter of ſurpriſe, and by ſome has been accounted for by a difference in the chronology of thoſe times. They conſider the antediluvian year as equal only to our lunar month; others, that it was equal to three months, by which means the patriarchs' lives would be reduced to two hundred years. It is not probable their years were equal only to our lunar months, for this would ſhorten the periods of their exiſtence to a term leſs than our own; which is unlikely, ſeeing we are told, that man's days were ſhortened for his great wickedneſs. We have, in our days, ſome inſtances of longevity recorded, though by no means equal to patriarchal duration: as Henry Jenkins, a native of Yorkſhire, who lived to 169; James Bowles, aged 152; Thomas Parr of Shropſhire, 152; theounteſs of Deſmond, a native of Ireland, 140; and in 1780, was living Louiſa Truſco, a negro, aged 175.

The following table of the various ages animals attain to, with the curious calculations and remarks annexed, I am indebted for, to Mr. Saumarez's Syſtem of Phyſiology. The curioſity, entertainment, and inſtruction in the ſubject, is a ſufficient apology for its inſertion.——The table of duration of animals, was by him taken from the Monthly Magazine, and is a tranſlation from the German.

A TABLE

OF THE DURATION OF LIFE IN CERTAIN ANIMALS.

	Years.
Inſect Tribe.	
The ſpider - - -	1
Scorpion - - -	1
Cricket - - -	10
Fiſh.	
Cray-fiſh - - -	20
Pike - - - -	100
Crocodile - - -	100

Tortoiſe	100
Carp	150

Birds..

Hen	10
Peacock	24
Nightingale, from	16 to 18
The Canary bird, if it breeds	10
———, if it does not couple	24
Lark, from	16 to 18
Sparrow-hawk	40
Gooſe	50
Swan	100
Eagle	100
Parrot	110

Quadrupeds.

Squirrel	7
Hare, from	7 to 8
Rabbit, from	8 to 9
Goat	10
Sheep	10
Fox	15
Cat	18
Ox, employed in agriculture	19
Cow	20
Hog	20
Wolf	20
Bear	20

Dog, from - -	20 to 28
Deer - - - -	20
Horſe from - -	25 to 30
Bull - - - -	30
Aſs from - -	25 to 50
Camel, from - -	50 to 60
Lion - - - -	60
Elephant, from	150 to 200

Man.

Suppoſing the earth peopled with 100,000,000 inhabitants, and allowing thirty-three years for a generation, it has been computed, that the deaths of each amounted to - 30,000,000

Of each day to - 82,135

Of each hour to - $3{,}442\frac{7}{24}$

But as the number of deaths is to the number of births, as 10 to 12, there are born every year - - 36,000,000

Every day - 98,569

Every hour - - $4{,}107\frac{1}{24}$

If mankind had not been doomed to die, there would have been at preſent about 173,000 billions of mortals on the earth, and in this caſe there would ſtill have been 9110 ſquare feet of earth remaining for each man.

Reckoning only three generations during a century, and ſuppoſing at the ſame time, that the world has only exiſted 5700 years, there have been only

171 generations from the creation to our own time, 124 ſince the deluge, and 35 ſince the Chriſtian æra.

On an equal ſpace, where there exiſts.

In Iceland	1 man	Germany	127 men
There are in Norway	3	England	152
Sweden	14	France	153
Turkey	36	Italy	172
Poland	52	Naples	192
Spain	63	Venice	196
Ireland	99	Holland	224
Switzerland	114	and	
Great Britain	119	In Malta	1,103

Out of every 1000 men, 28 die off annually.

The number of inhabitants of a city or country, is renewed nearly every thirty years.

Of 200 children, no more than one dies in the birth.

Of 100, one does not die during the mother's lying in.

Of 1000 infants, fed by means of the mother's milk, not above 300 die; but of the ſame number reared by wet nurſes, 500 die. The mortality of children has augmented greatly during the preſent luxurious age; convulſions and teething kill the greater number of them.

The natural ſmall pox uſually carries off eight in every hundred attacked by it; but of 300 inoculated, no more than one dies.

Among 3,125 who die, it appears, by the regiſters, that there is only 1 perſon of 100 years of age.

More old men are to be found on elevated ſituations, than in plains and valleys.

The proportion between the deaths of women, and that of men, is as 100 to 108. The probable duration of female lives is 60; but after that period the calculation is more favourable to them than to the males.

Married women live longer than maidens.

In the country, the ſpring is the moſt fatal period; but in great cities it is the winter.

One half of thoſe who are born, die before they attain the age of 17; thus, they who ſurvive that period, enjoy a degree of happineſs, which a moiety of the human race is unable to attain.

The number of old men, who die in cold weather, is to the number of thoſe who die in warm weather, as 7 to 4.

According to the obſervation of Boerhaave, the moſt healthy children are born in the months of January, February, and March.

The married women are to the unmarried, in the ratio of 1 to 3; and the married to the unmarried men, as 3 to 5. The number of twins born, is to that of ſingle children, as 1 to 65 or 70.

The number of marriages is to that of the inhabitants of a country, as 175 to 1000.

In the country, there are about four children produced by every marriage; in cities, there are but 35 to 10 marriages.

The men able to bear arms, form the fourth part of the inhabitants of a country.

PART THE SECOND.

THE

ANATOMY

OF

THE HORSE;

OR,

A DESCRIPTION

OF THE

Structure, Functions, and Œconomy

OF ALL

THE PARTS OF HIS BODY.

EXTERIOR CONFORMATION

OF THE

HORSE.

SECTION VII.

BUFFON obſerves, that the moſt noble conqueſt man ever made, has been over the horſe. And when his very great utility is conſidered, we need not heſitate agreeing with this learned author. The horſe in *Zoology*, and according to the Linnæan ſyſtem, is a diſtinct genus of animals of the order of *belluæ*, the characters of which are, that the fore-teeth are ſix in each jaw, the upper erect and parallel, the lower more prominent; the canine or dog-teeth, are ſingle, placed at a diſtance from the others, and but little longer than the inciſive; the hoof is formed of one piece*.

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* "Animal generoſum, ſuperbum; fortiſſimum in currendo, "portando, trahendo, aptiſſimum equitando, curſu furens; ſyl- "v is delectatur, poſteriora curat, caudâ Canopes Tabanoſque abi- "git;

The exterior conformation of the horſe, is a branch of knowledge, that very properly precedes a conſideration of his internal ſtructure; but in this deſcription, I ſhall not enter into a minute detail, becauſe I rather chuſe to blend the uſes, beauties, and defects of parts, with the anatomical examination; not only becauſe the various organs by this means become better underſtood, but becauſe the anatomical treatiſe is thereby enlivened and diveſted of its dryneſs; the reader is therefore referred to the individual deſcription of each part in the Splanchnology, for a more full account.

A horſe, conſidered generally, may be divided into head, neck, trunk, and extremities; the differ-

“ git; alterum ſcalpit, pullum injuriæ obnoxium reponit; hinnitu ſocium vocat; dormit poſt noctem; calcitrando pugnat; ſudans ſe volutat; vegetabilia edit bove propius, ſemina diſſeminat; ſtercus incaleſcit, cyſtide felleâ caret; non vomit; equuleus Hyppomane natus, pedibus elongatis; læditur globulo auris, litis, Padi herba, Phellandrii, curculione, conope irritante. Laborat hernia mediaſtini, polypo cordis, ortopnæâ, œſtro bovis, nanaſali, hæmorrhoidali ſcabie, tartaroque pedum, bubone colli; Hyppocomiâ inſtruitur. Edit impunê aconitum. Utero gerit 290 diebus, placenta non fixa. Laniarios dentes quinto anno acquirit.”

Syſtema Naturæ.

“ Le cheval eſt ſans contredit le plus utile des animaux ſoumis à l’empire de l’homme; nous avons pour premier garand de ſes grandes qualités, l’ eſtime générale dans laquelle il a toujours été; cette eſtime a été portée anciennement à un degré ſi haut, qu’on a accordé á un Dieu puiſſant du Paganiſme.”

Le Parfait Marèchal

“ Fudit equum magno tellus percuſſa tridenti.”

Virgil. Georgic. lib. 1.

ent parts compriſing each of which, have various terms of art in general uſe appropriated to them; and it has been found from long experience, that there is a peculiar form for each of theſe that is beſt adapted either to the general purpoſes of the animal, or to the uſes we put him to. It is probable that Nature, though ſhe made ſome varieties in the ſhape and form of the animal, yet made but few to what at preſent exiſts. Climate certainly induces conſiderable varieties, but art has induced many more. The ſmall horſe of the eaſt, and the unwieldy animal of Friezland, are ſufficient inſtances; yet the ingenuity of man has multiplied them by different mixtures to his own uſe and advantage.

The *head* ſhould not be too large; it otherwiſe is heavy in appearance, and forms a real weight to the horſe; which is ſtill more encreaſed if there is a long neck. It ſhould be lean, and the countenance well marked, it ſhould likewiſe be of a proper length, and well placed. It may be remarked, that a large head in a draught or carriage horſe, is by no means a defect equally great, as in a horſe for the ſaddle. The *ears* ſhould be well placed, and not at too great a diſtance from each other; they ſhould likewiſe be ſmall and pointed. It appears wonderful that nature ſhould ſo frequently give this animal ears, that appear to us defective, with motions leſs vivacious and quick than uſual, and conſequently not adapted to receive the various ſonorous waves. It is this deformity that has given riſe to the cuſtom of cropping. Whether this is attended with all the ill effects that are attributed to it I doubt. Certainly in ſtorms, horſes that are cropped are impatient, and appear to ſuffer; but at other times they ſeem to feel no inconvenience; nor can this probably have much effect in hurting the internal organ of hearing; though it may ſo far influence it, as to prevent the complete collection of ſo many ſonorous waves; trimming the hair cloſe probably is as hurtful, or more ſo than cropping. The ears are uſually ſuppoſed criterions of the ſpirit of the animal, and I have ſeldom ſeen a horſe who carried one ear forward, and the other backward during his exerciſe, eſpecially if on a journey, but what was laſting and good. The reaſon appears a plain one; a horſe of ſpirit, ſtrong, and not eaſily fatigued, is attentive to every thing around him, and directs one ear forward and one ear backward to collect ſound from every quarter. I need not mention, that the ears are an indication of the temper of the animal; and that he is ſeldom either playful or vicious, but the ears are laid flat on the neck. It was kind in providence to give us ſuch a warning, in an animal who does not want craft to ſurprize us, nor ſtrength to render his reſentment terrible. They are likewiſe indicatory of blindneſs when carried forward and backward as in alarm, on a horſe's coming out of the ſtable.

The *forehead* is that part immediately below the ears, extending to the eyes; it ſhould neither be very wide, nor very narrow. The French eſteem an arched forehead a mark of beauty; but with us, it is not regarded as ſuch, though it cannot influence the other qualities of the animal.

The *eyes* are very material points, and will be more particularly deſcribed in the ſplanchnology. They ſhould be placed at a proper diſtance from each other, and their ſize proportionate to the head; if ſmall, they are called pig eyes, and are uſually ſubject to diſeaſe, particularly if loaded with much cellular membrane; if large, they are frequently not exempt; but a large eye is ever preferable to a ſmall one. The convexity of the eye ſhould be attended to; when horſes have their eyes gogling, they are frequently ſhort-ſighted, and thus ſeeing objects falſely, are given to ſtart; this is not uſually attended to, but is a very neceſſary caution. The eye ſhould be examined in the ſhade, and between the examiner and a moderate light; no glaring or white object ſhould be near; hence dealers uſually endeavour to ſhew a horſe with diſeaſed eyes againſt a white wall. The cornea, or the tranſparent covering of the eye, ſhould not only be clear, but the humours underneath likewiſe. If they appear cloudy, and with a milky hue, there is uſually an incipient cataract, and blindneſs will enſue; there ſhould be no ſpeck or dragon, as it is called, or it betokens the ſame. If there is an appearance of greenneſs in the eye, or in what is termed the pupil, which is nothing more than the humours ſeen through the opening left for the tranſmiſſion of rays through the iris; if in this there is an appearance of greenneſs, and a glaſſineſs, from whence ariſes the farrier's term of glaſs eyes; it ſhews a gutta ſerena. It ſhould be tranſparent and bluiſh, but not glaſſy. This may be farther proved by obſerving whether the iris, or this curtain forming the pupil, contracts and dilates; that is, when the hand is placed over the eye for a little time, the iris will dilate ſo as to increaſe the ſize of the pupil, to admit more rays; but on the removal of the hand will again contract, and leſſen the pupil, to exclude them. A blind horſe likewiſe uſually carries his ears as though alarmed in quick changes of direction, and hangs back on his bridle or halter, lifting his legs up very high; in fact, preſents every indication that a perſon blindfolded would do. Inflammation of the eyes is known by the appearance of tears running down the face, and an impatience of light. When the opaque cornea is very conſpicuous, the horſe is ſaid to be wall-eyed; but ſuch eyes have no peculiar diſpoſition to diſeaſe, but the real wall-eyes are ariſing from a whiteneſs in the iris; ſometimes only one part of the iris is white and the reſt of the uſual colour. The eye-lids ſhould be thin, and not overcharged with fat. The depreſſions over the eyes are ſtyled the eye-pits. In young horſes who have much exterior fat, theſe are not very evident, but from age they become hollow and pitted. It is ſaid, that the progeny of old ſtallions, or old mares, have the eyes pitted through life.

The *face* is ſituated between and below the eyes. It is frequently, in dark horſes, of a colour different to that of the reſt of the body. When there is white extending from the forehead down the face, it is termed a blaze; if this is extenſive, it is a deformity; when there is only a ſpot of white on the forehead, it is termed a ſtar, and is eſteemed a beauty; and therefore various means are made uſe of to produce an artificial one, ſuch as bliſtering, burning, or in any way deſtroying the old hair, when the new will be white; but care ſhould be taken that the wound is not ſo deep as to deſtroy the true ſkin, or it will produce baldneſs.

All the lower part of the head, including the ends of the noſtrils and the lips, is called the muzzle; ſometimes this has hair of a different colour to the reſt of the head, ſometimes the blaze extends into it, when it is called a ſnip; the darker the colour of the muzzle, the better the horſe is eſteemed. The *noſtrils* form the entrance into the cavity of the noſe; they ſhould be wide, that the air may have a free paſſage. Before a horſe is bought, they ſhould be examined to ſee that there is no inflammation or ulcers on the membrane lining them, producing a thick matter and conſtituting glanders; the little opening of the naſal duct, that preſents itſelf towards the bottom and back part of the noſtrils, as ſoon as the noſe is opened, muſt not be miſtaken for an ulcer. In ſome countries they ſlit the noſtrils, to encreaſe the power of breathing; in others it is ſaid it is done to prevent neighing. In Malta, they perform this operation on their aſſes.

The *lips* ſhould be thin and well ſupported, when thick, they interfere with the action of the bridle, and are not favourable to beauty; when they are pendant they ſhew age or debility. Some horſes frequently ſtumble and even fall, and yet ſave their knees; at leaſt ſo much as not to produce a ſcar, and that irregularity in the growth of the hair, termed broken knees; but they are often leſs fortunate with their mouth, and there will be found in the inſide of the upper lips of ſuch horſes, a ſcar or hard lump, remaining from ſome fall. The lips ſhould therefore be examined on the inſide.

The *beard* is that part where the curb reſts, and a little below it; perſons who ride in the riding-ſchool or manege, inſiſt much on the form of this; they may be too much or too little ſenſible. When they have ſharp edges, and a thin ſenſible ſkin over them, they become exceſſively tender; and the heavy hand of an unfeeling oſtler may endanger the rider's life; for a horſe in that caſe will become reſtiff, and plunge, to free himſelf from his uneaſineſs, and this will be the more likely to happen when the rider himſelf follows the uſual ſyſtem of bearing on the bridle*. If, on the contrary, the branches of the jaw, forming the reſt of the curb, are too rounded, and the ſkin thick and inſenſible, then the bridle will not command its accuſtomed obedience.

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* It is remarkable how little many perſons in this country underſtand the real uſe or management of the bridle. They are uſually ſaid, in the language of the riding ſchools, to have no hand

The *mouth* is to be examined for the teeth, palate, and bars. The *teeth*, in the purchaſe of a horſe, form a criterion as to the age, the deſcription of which will be fully given when deſcribing the bones. The *palate* ſhould not be too fleſhy, or it will be two ſenſible to the bit, particularly thoſe with a raiſed part

hand upon a horſe; but they too frequently not only have one, but two very heavy hands upon him. Among the generality of riders, the bridle is of no uſe but to guide the horſe; to ſtop, and perhaps in many inſtances, to hold themſelves on by: whereas theſe, at leaſt the two former, though eſſential uſes of the bridle, are by no means all to which it may be applied. By the bridle you converſe with your horſe; it is the medium of conveying your ideas, and like the ſpurs ſhould only be uſed as perſuaſives, not as the rough inſtrument of torture. By the bridle, a horſe is prevented from fatigue, and I will venture to aſſert, that a man of fourteen ſtone, with a due knowledge of the management of this article of horſe appointment, would ride farther in a day, and with leſs diſtreſs to the animal, than another, without this art, of ten ſtone. Let any one apply this to himſelf: if he has continued walking in one unvaried pace and manner for two or three hours, how fatigued and liſtleſs he feels; if his pace is altered either ſlower or faſter, and his ideas drawn to any other ſubject, by company, by ſurpriſe, fear, or hope; how he forgets his fatigue and appears renovated. ——By the bridle properly managed, different ſets of muſcles are alternately called into play, the horſe is at one time preſſed forwards with the legs and a looſe rein, at others, his centre of gravity is changed, and the principal action thrown on the hinder extremities, thus relieving the fore legs which were before principally concerned.

or

or port. The *bars* are parts that are very eſſential to the proper obedience of the horſe, and are thoſe ridges in the poſterior jaw, between the tuſh on each ſide and the grinders. A late author has ſaid, nature placed this ſpace purpoſely for the bit to reſt upon, but it would rather appear, that it is left by nature unprovided with teeth, becauſe in this part they would be uſeleſs, as they would have nothing to do, and as grinders they would be removed too far from the centre of motion. Like the beard, the bars ſhould neither be too fleſhy, or too lean, too round, or too ſharp. If by a rude hand they have been ſcarred, the feeling from the bridle can never be true.

The *channel* among horſemen is that hollow that is formed between the two branches of the poſterior jaw; internally it lodges the tongue, more exteriorly are placed glands, veſſels, and fat. It ſhould not be too wide, or the head appears ill ſet, and ſuch a horſe will bear in his head to relieve himſelf from the preſſure of the bit; but on the contrary, if it is too narrow, the head cannot be well carried, as it will not ſuffer part of the neck between it.

The *neck*, is all that part from the knol-bone at the top of the head, to the withers, or where the mane ends; and all that part underneath from the beginning of the throat, to where it ends in the neck. The neck ſhould neither be long or ſhort; if long, the head will be too weighty and fatigue the muſcles of the neck, for the addition of every inch in length, will make the head many pounds heavier in proportion, as it is removed from the fulcrum of the lever. If, on the contrary, the neck is ſhort, the lever in the hand of the rider will be too ſhort. Such a horſe will reſiſt, and ſeldom preſent an obedient mouth; he will be apt too to bear the branches of the bit on his counter or cheſt, and thereby make a falſe appui. On the contrary, with a long neck, there is ſeldom a firm bearing againſt the preſſure of the bit, and ſuch horſes are frequently ſtar-gazers. The neck has other defects beſide the encreaſed or diminiſhed length; it is ſometimes with its arch reverſed, or ewe-necked: ſuch horſes ſeldom carry their heads properly, but almoſt always throw it up, and carry it too high. In ſtallions, particularly thoſe of Barbary, and ſome other countries, the neck is often too much arched, and with that defect is overloaden with fleſh, in ſome ſo much ſo as to double over, and it has been the cuſtom in theſe inſtances to cut away the ſuperfluous part, but this muſt be a cruel operation, and attended with bad conſequences. The neck is at times properly ſhaped till it comes to the withers, where ſuddenly it forms an excavation as though a piece was cut out, and hence is called hatchet-necked. A tradition among the French exiſts, that this excavation was made by the prowefs of ſome warrior, on an individual horſe, whoſe future progeny bore this mark. Mares have uſually leſs creſt than horſes, that is, their necks are not ſo much arched, but this admits of exceptions.

The *wind-pipe* ſhould be large, and free from much ſurrounding ſubſtance; this beauty is very common among blood horſes and is very material to the progreſſion.

The *mane* is that long hair that crowns the neck throughout its whole extent; that part of it immediately in front of the head is called the foretop. Nature appears to have deſigned this part ſimply for beauty to the animal; had it been for a guard to the neck, it would have been on either ſide; whereas, when not altered by art, as in dragoon horſes, it hangs naturally to one ſide alone. In ſtone horſes, it is uſually abundant, and frequently gives riſe to a mangy eruption*.

The *trunk* compriſes various parts. The *withers* are formed from the long tranſverſe proceſſes of the dorſal vertebra, and as their uſe is to ſerve as levers to muſcles, ſo their length muſt be of great advantage; hence horſes with high withers uſually go much above the ground; that is, the muſcles of the back acting to greater advantage, the fore parts are more elevated during progreſſion; and this may ſerve to ſhew riding maſters, that a horſe, going above his ground, does not depend altogether upon the motion of the ſhoulders, nor on the height to which he lifts his legs, but likewiſe upon the extent to which his general forehand is carried by the action of the dorſal muſcles; when that is well up, as it is termed, it gives greater room and play for the other parts to be moved through a larger ſpace; for a horſe it is evident can deſcribe a greater portion of a circle, in the time of a conſiderable elevation, than in that of a ſmall one; and as his fore legs are deſcribing a ſegment of a ſmall circle, while his withers are deſcribing a portion of a larger, and as theſe may be conſidered as proportional, ſo it follows, the higher the withers are carried, the greater extent there is for the legs to act in, and the longer time for a higher elevation. But it is evident this only applies to ſuch horſes as are wanted for particular purpoſes: in the cart horſe, whoſe weighty forehand is of great ſervice, as he draws by an effort to preſerve himſelf from the tendency to the centre of gravity, ſo the more he is loaden before, and the nearer he approximates this centre, the more advantageouſly he applies his powers. Nor is it ſuppoſed eſſential to the race-horſe; indeed moſt animals deſigned for ſpeed in the gallop, which is but a ſucceſſion of leaps, have their fore parts low; but this is uſually in the ſhortneſs of their fore legs, and not in the defect of their tranſverſe proceſſes. Perſons frequently miſtake the real beauty of the withers, and ſuppoſe that only height is requiſite; but this is not the whole; inſtead of being thin, as is ſometimes ſeen, and eſteemed beautiful, they ſhould have a portion of fleſh to give them ſtrength. There are horſes, particularly of the Dutch kind, who are remarkable for their going with their foreparts up though their withers are not high; but this is done in them, from the great ſtrength of the muſcles of the haunches and croup, and the inclination of the hinder extremities to approach the common centre of gravity of the whole body; and hence the tendency of the fore extremities is relieved, therefore horſes who are weighty before, might be made uſeful; and prevented from ſtumbling by a good rider. In ſuch the tendency towards the ground ſhould be obviated by the rider's placing his weight backward; hence in race-horſes, where the reverſe of this is wiſhed, the ſaddle is placed forwards.

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* The hair of the mane, like our own, grows more abundantly than is neceſſary to ſupply the common waſte, hence it is forced to be thinned, and ſhortened. Grooms do this by pulling it, ſome by cutting; but neither are good modes. In my own ſtable, I have found that the frequent uſe of a three-pronged angular iron was the beſt means of keeping it thin, and yet aſſiſting its laying well.

The *back*. Where the withers end the back begins. It ſhould not be too long, for a cylinder of a certain length will not be ſo ſtrong as one of a leſs length, nor can it bear ſo much; hence long backed horſes are eaſy, becauſe the action and re-action are conſiderable, and thus reſemble a ſpring; but what they gain in eaſe they loſe in ſtrength; the ligaments are longer, and the muſcles are longer, and hence act to greater diſadvantage; therefore it is that long backed horſes are uſually put to draught. When the back is too ſhort, ſuch horſes, by having their extremities too much approximated, uſually overreach. The back may be curved inwards or outwards,

wards, when outwards, it is termed roached backed, when inwards ſaddle backed or hollow backed; theſe latter are uſually weak, but pleaſant, and have good creſts; the counterpoiſe is kept up in curves by this means. Horſes of this deſcription have uſually, likewiſe, large prominent bellies. The back extends to the poſterior part of a common ſized ſaddle.

The *loins* then commence. They ſhould be likewiſe not too long, and the muſcles of the back, as being very principal organs in motion, ſhould be prominent and large, ſo as to give the loins an appearance of being double, ſwallowing the ſpinous proceſſes of the lumbar vertebra between them. The loins ſhould be wide acroſs, that is, the tranſverſe proceſſes of theſe vertebra ſhould be long, that there may be an extenſive ſurface for this lumbar maſs moving the loins. The ribs ſhould likewiſe approach the hips, leaving the loins ſhort and well knit.

The *haunches* or *hips* are the two riſings that are ſeen on each ſide of the extremities of the loins. They conſiſt of the bones of the ilium. It is a large tuberoſity of that bone that forms the point of the haunch or hip; when this is preternaturally long, ſuch a horſe is ſaid to be hagged hipped; but it is objectionable only on account of its want of beauty. Theſe parts ſhould be wide, that there may be an extenſive ſurface for muſcles, and as the hind quarters are the principal ſource of motion, ſo it is evident all the parts about the haunches, croup, and buttocks ſhould be large and well furniſhed. The diſtance from the point of the haunch to the buttocks ſhould be conſiderable, which aſſiſts in forming a beautiful quarter.

The *croup* is the riſing formed between theſe bones of the ilium and the ſacrum, and is called the rump, extending to the tail or dock. It ſhould be properly rounded, and not fall too ſuddenly, or it gives the horſe an appearance of a ſhort rump, and is not favourable to ſpeed; for in all animals whoſe gallop is quick, the croup is nearly ſtraight, and the tail but little depreſſed from the rump. If however the croup is ſo ſtraight, that the tail is of equal height with the haunches, it is a defect; nor ſhould the rump be ſo long as much to out-paſs the line of the hock, nor ſo ſhort as not to extend to it. The tail ſhould be properly ſupplied with hair, when deprived of this, it is termed rat tailed; though many perſons ſuppoſe rat tailed horſes are always good.

The *extremities*. The proper formation of the parts compoſing the extremities, is of the utmoſt conſequence in the value of the animal. The *ſhoulders* are thoſe parts that extend from the withers on each ſide, obliquely to the point in front of the counter or cheſt, and which is called the point of the arm or ſhoulder, but is wholly formed of the bone of the arm. In horſes deſigned for extenſive action, either in trotting, galloping or walking, it ſhould be muſcular, but not overloaden with fleſh. If too lean they want ſtrength, if too heavy they impede the motion. But it is too frequent, that perſons miſtake a muſcular, for an overloaden ſhoulder: if the ſhoulders and withers have not ſufficient extent of muſcle, the horſe can have but little extent of power before. The ſhoulders are not connected, as with us, by means of an intermediate joint, but as animals have no collar-bone, ſo the connection is wholly muſcular; and by this means is rendered elaſtic, which it would not otherwiſe be; hence riding on the croup of a horſe, where the union is bony throughout, is very unpleaſant, and uneaſy. When the body is propelled forward, its tendency to the centre of gravity is contracted by the fore extremities, which then receive the maſs: had the ſhoulders therefore had a bony connection there would have been a great ſhock; but as it is, the ſtrong muſcles of theſe parts receive and ſuſtain what the hind quarters have thrown on them, till the angles of the hind legs have been alternately contracted and extended, to the repropelling the maſs, while the dorſal muſcles are ſuſpending the fore-parts. The centre of action in the ſhoulder is within its own middle, and the motion it enjoys, is confined to the perpendicular backwards, and to as great an elevation as the muſcles will admit of forwards. Thus it is evident the more oblique its ſituation, the greater number of degrees it can run through, and hence be more extenſive in its motions. (See this more fully treated of in the oſteology.) It is the cuſtom with ſome perſons to put horſes early to plough, to throw their ſhoulders backwards; but whether the obliquity is encreaſed by this means is queſtionable. And when they are too much loaden it is the practiſe with others to ſweat them by keeping them cloathed warmly acroſs the ſhoulders, whereby it is ſuppoſed they become finer.

The parts between the points of the arms, or ſhoulders, is called the *breaſt* or *counter*; it ſhould be wide and extended; when narrow, the horſe is ſeldom powerful or durable; the lungs have not ſufficient room for expanſion, nor the muſcles ſufficient extent of attachment; ſuch horſes have uſually weak ſhoulders, and the fore extremities being too near each other, render them leſs firm than they ſhould be. The breaſt may however be too wide, and particularly when the parts in front are very prominent, from whence ariſes too great a weight in the fore parts.

The part oppoſed to the point of the ſhoulder or arm, is termed the *elbow*. The width of this part, and its forming a conſiderable angle with the arm, is a matter of the utmoſt conſequence, for as it is a lever for the extenſor muſcles of the fore arm, ſo its length muſt make all the difference in power between a long and a ſhort purchaſe; any one the leaſt acquainted with mechanics muſt be aware how great this is. The ſpace between the point of the ſhoulder and the elbow, is properly the arm, though it is not uſually among horſemen conſidered as ſuch, originating from a want of conſideration of the internal ſtructure. It ſhould be placed in the line backwards, as the ſhoulder is forwards, and the more accute the angle between theſe parts the better; for the greater will be the extent and ſtrength of the motion deſcribed by the opening of this angle. The *fore arm* is uſually called the arm, but improperly. It is eſſentially neceſſary that it ſhould be large, ſhowing ſtrong marked powerful muſcles; for in every inſtance a ſmall fore arm is a certain indication of weakneſs. All animals intended for quick motion have this part long; the knee in the greyhound is but two or three inches from the ground; but though this part ſhould be long for quick progreſſion, it is not equally eligible for the cadences of the manege, and hence horſes of this deſcription are choſen with a ſhort fore arm.

The joint immediately below this, which in the human forms the wriſt, is in the horſe termed the *knee*. All the joints of a horſe ought to be broad and extended, whereby the ſurface of contact is encreaſed, and the ſtability in proportion augmented, they preſent likewiſe by this means a broader ſurface for the attachment of muſcles, and remove their inſertion farther from the centre of motion, thereby encreaſing their power. The knee ſhould be examined to ſee whether the ſkin has been broken by ſtumbling, and great caution is neceſſary in this, for it ſometimes grows ſo well up as hardly to be diſcernible, and frequently the dealers uſe ſome colouring

ing matter, whereby the part is rendered black; but it does not follow that a mark or ſcar always indicates a ſtumbler, and perſons are too apt to forget, that the beſt horſe may have an accident and fall, which will never influence his future manner of going, unleſs the cicatrix ſhould be of ſuch extent as to interfere with the motion of the joint; if therefore the arm and fore arm are ſtrong, the forehand high and the horſe ſhews good action, he ſhould not be rejected wholly from an accidental blemiſh.

The *canon* or *ſhank* is the part below the knee, and it is highly requiſite this part ſhould be well formed, that is, thin and broad; for it is purely bony and tendinous, ſo any increaſe in ſize laterally muſt only ariſe from cellular ſubſtance, or ſome ſwelling which will interfere with the motion without adding to the ſtrength. There is within the knee, and at the ſuperior part of the canon, a bone of the carpus purpoſely ſet out at a diſtance from the reſt, for the inſertion of a muſcle, and likewiſe for the ſupporting of ligaments that bind down the tendons; when this is ſet wide out, the muſcles bending the parts below are ſituated more advantageouſly for action, and the tendons are likewiſe not bound too cloſely, but are removed conſiderably from the centre of their motion, whereby their powers are much encreaſed; and this is ſo certain, that a horſe tied in under the knee, as it is called, is never found to be able to bear exertion long, he ſoon becomes ſtrained and worn out, and his legs become arched. The tendons called the *back ſinews* therefore ſhould be detached from the bone, and not only detached, but large, whereby their ſurfaces of attachment and inſertion are greater, as well as their comparative ſtrengths. When the tendons are become one rounded body, even with the bone, there is uſually diſeaſe; the cavities between the tendons and their theca or ſheaths, are uſually deſtroyed, and motion thereby impeded and rendered painful. The upper and inner part of the ſhank bone is the ſituation for what is termed *ſplent*, which is a throwing out of bony matter; in ſome ſituations cauſing pain and lameneſs, in others being of little conſequence. At the bottom of it likewiſe the ſheaths of the tendons, from over exertion, are throwing out more fluid than is proper in mucous capſules, which cauſes *wind-galls*, which if conſiderable, may interfere with the motion; and at all times ſhew, either that too much exertion has been made uſe of, or that the horſe is naturally not ſtrong, and are therefore ſo far objectionable.

The *paſtern* is the next joint to the knee, and all the part below this joint and the hoof is termed paſtern. The poſterior part is called *fetlock*, and the inferior part of it *coronet*, crowning the hoof. The paſterns ſhould not be too ſmall, or they are otherwiſe weak, when too long likewiſe it is unfavourable to ſtrength. Though the flexibility is encreaſed and the animal moves more pleaſantly to his rider, yet the deviation from the perpendicular muſt be more conſiderable; and hence there muſt be a detraction from the ſtrength; the flexor tendons in theſe caſes are put too much upon the ſtretch, and in time become ſtrained and defective. But the paſtern being too ſhort and upright, is an equal defect; for here the flexibility of the ſpring is loſt, and from the perpendicular ſituation the bones bear all the ſhock, and ſuch horſes always knuckle over, when they have been worked a year or two.

The *foot* is a part of the utmoſt importance, and cannot be too attentively examined by a perſon purchaſing a horſe, nor too well underſtood by thoſe whoſe buſineſs or pleaſure leads them much among horſes. Whenever the foot is preternaturally contracted, ſuch a horſe moves with pain and difficulty, therefore the heels ſhould be wide and open, but not too near the ground. There ſhould be no matter exuding from the cleft of the frog, which is frequent in high and narrow heeled horſes, called running thruſh, and which if not kept under, ruins the horſe as certainly as a more formidable diſeaſe. I have obſerved dark cheſnut horſes peculiarly liable to contracted heels, which is a remark I never remember any other perſon to have made. Does this ariſe from any particular diſpoſition to contraction in theſe horſes, or does it only ariſe becauſe horſes with this colour have uſually much of that breed termed blood in them? The form of the foot and deſcription of its parts will be much more fully treated of in the deſcription of the extremities.

The *carcaſe* is compoſed of ribs, belly, and flank; the *ribs* ſhould form the body and cheſt as much as poſſible into a circular figure, that being of all others the moſt extended, and the beſt ſurface for abſorption; thus barrelled horſes are greatly preferred. When the cheſt is too ſtraight and flat the *belly* is alſo ſmall; hence neither can the blood abſorb its vital principle from the air, nor the lacteals the chyliferous juice from the inteſtines in ſufficient quantities; therefore theſe horſes are weak and never durable, for they are ſhort breathed and cannot thrive. As leſs nutriment is taken up by the conſtitution, ſo leſs is eaten, thus they ſeldom are good feeders, and as the preſſure on the inteſtines muſt be conſiderable from the ſmall containing ſurface, ſo are they uſually what is termed waſhy, that is, eaſily purged, whereby an additional cauſe of weakneſs exiſts, from the too early paſſing off of the food. A knowledge of the advantages gained by ſize in the belly, is what conſtituted Mr. Bakewell's grand ſecret, in the breeding of cattle; he always bred from ſuch as would be moſt likely to produce this form, well knowing no other would fatten ſo advantageouſly. Horſes likewiſe with this defect in their cheſt and bellies having leſs power in breathing, uſually become broken or thick winded, for the great exertions made to gain a ſufficient quantity of air under exerciſe, ruptures the air cells of the lungs.

The *flank* is the ſpace between the ribs and the haunches, this part ſhould not be too extenſive, or it indicates weakneſs in the loins, and too great length in the back. If it is hollow it ſhews ſhortneſs in the tranſverſe proceſſes of the lumbar vertebra, and hence a want of room for the large muſcles of the loins. When the flanks heave without other ſymptoms of ſickneſs, ſuch horſes are uſually broken winded.

The *hinder extremities.* The *whirl bone* among jockies is the articulation of the thigh bone with the pelvis, and is a very ſtrong joint rarely diſlocated, but its ligaments are frequently extended; when a horſe is ſaid to be lame in the whirl bone or hip joint, and as the powers of renovation are ſmall in theſe parts, ſo there is uſually long lameneſs, and the muſcles waſte. From this joint to the real knee or ſtifle in front, and to the buttock behind, is uſually called the quarters. As the large motive organs are here placed, and the ſtrong muſcles of the thigh and leg are here ſituated, this part ſhould therefore be wide, as it indicates an extended ſurface in the bones of the pelvis, and the advantage taken of this by the muſcles to ſwell and encreaſe: hence large and wide quarters are a great mark of ſtrength.

The *ſtifle*, is the part that approaches the flanks in action, and correſponds to the knee of the human; conſequently the part below it ought to be called the leg, but it is uſually known by the name of the thigh or gaſcoin. For the reaſons before mentioned, it ſhould be ſtrong and muſcular, it ſhould likewiſe make a conſiderable angle with the femur or thigh, forming a direct line under the hip or haunch; its length as it is ſeen in all animals deſtined for much ſpeed, ſhould be conſiderable. All that part below the ſtifle to the hock, which is called improperly the thigh, ſhould be very large and ſtrong; whenever it is thin and poorly furniſhed with muſcles that horſe is weak.

The *hock* forms the joint between the thigh commonly ſo called, and the canon; and is the moſt complex and important joint of the body; it ſhould be broad and wide, with the point extended far out, whereby the muſcles inſerted into it have greater power. This part ſhould be attentively examined, for upon it much of the value of the animal depends; for as the calcaneum, which is the bone that forms the real heel, and is called the point of the hock; as this extends further from the other bones, encreaſing the breadth of the joint, ſo the tendons inſerted into it act with a longer lever, and thus with a great increaſe of power. This joint is much ſubject to diſeaſe, as blood ſpavin, which is a dilatation of the mucous capſules on the inſide of the hough, and which occaſions an enlargement of the vein, that runs over them. The mucous capſules on each ſide likewiſe become ſometimes enlarged, forming thoroughpin; and the bones may alſo become enlarged, which is then called bone ſpavin. The anterior part of the hock joint is called the ham; it ſhould be free from the ſcurfy eruption termed ſellenders. The leg below the hock, properly forming the ſhank or canon, ſhould have a ſimilar conſtruction with the ſame parts before; and the ſituation of the whole ſhould be ſuch, that it falls perpendicularly from the ham or hough to the ground. When the hocks approach each other too much, the horſe is ſaid to be *cat* or *ſickle hamed.* It is ſaid, ſuch horſes are ſpeedy, but it is hard to reconcile this to ſound reaſoning; certainly they muſt be weaker as the limbs are out of the proper line of direction with the other parts above; and we know the increaſe of preſſure on the inner ſide in theſe caſes produces ſplents, ſpavins, and the deformities to which theſe parts are liable.

Colour of Horſes.

The *colour* of horſes does not depend on their real ſkin, as with us, but upon an exterior beautiful covering nature has kindly given them, called hair; nevertheleſs, the hair is in ſome meaſure influenced by the ſkin, as light ſkinned horſes have light hair, and where there is white hair there are uſually light eyes. As this hair is preſenting very conſiderable varieties in its tints, ſo horſes are ſaid to be of various colours. Buffon has claſſed theſe into ſimple colours extending all over the body; into compound, being thoſe mixed with others; and into ſtrange and extraordinary colours. The *ſimple colours* are the white, the dun, the ſorrel, the bay and the black. The *compound* are the grey, the mouſe, the roan, and red roan. The *extraordinary* are the tyger, the pyebald, the ſtrawberry, and the flea-bitten. Buffon ſeems to think that bay is the natural colour of European horſes, and that in a complete ſtate of nature all would be bay; but this has been ſuppoſed rather fanciful, though it is probable much might be urged in its favour. The bay has different ſhades; and hence forms the bright bay, the dark bay, the dappled bay, and the light and dark cheſnut. The brown bay is a large mixture of black, and is uſually eſteemed excellent. The dark bays have commonly black manes and tails, and likewiſe black legs and hoofs, and are very juſtly preferred. The light cheſnuts are thought to be on the average number rather weak; many of them are however very excellent: the Suffolk punches, a moſt valuable ſet of draught horſes, are of this colour.

The dark cheſnuts are fiery in their diſpoſitions, and I think particularly ſubject to contracted feet.

The black is an eſteemed colour among us, and are of different ſhades. Black horſes admit of all the characters, from the moſt fiery and impatient, to the moſt ſluggiſh and patient.

The dun is a colour that has ſeveral varieties; it is ſometimes accompanied with a white tail and mane, at others with one darker than the natural colour of the hair; in ſome there is a liſt extending down the back, which is ſometimes ſeen in the bay. The darker the tint the more is the horſe uſually eſteemed.

The ſorrel is a ſpecies of the cheſnut of a lighter red; and this likewiſe admits of varieties.

Of the compound colour.—The roan is a mixture of red and white, and gives the common roan, the red roan, and the dark roan.

Grey horſes admit of ſeveral ſhades, or different proportions of white and black, as dappled grey, ſilver grey, and iron grey. Theſe horſes are much valued on account of their beauty, ſometimes a ſlight tint of bay mixed with the white and black, forms a variety in the grey. Grey horſes, like the black, admit of no ſettled character, but have all the extremes within their range, nevertheleſs the darker greys are preferred.

Pied horſes form the moſt frequent among thoſe called extraordinary. They conſiſt uſually of white and ſome other colour, placed in different parts diſtinct from each other, as white and bay, white and cheſnut, and white and black. The flea-bitten is a grey or white horſe with ſmall bay ſpots intermixed; when theſe are very large and have a lighter ground around them, they have been called tyger coloured.

It is found from experience, that the varieties in colour influence in ſome degree the real qualities of the animal, and it may be regarded as a general rule that dark horſes are the beſt; yet this, like other general rules, admits of exceptions. White haired horſes like white haired perſons are irritable and weak; the hair after a wound is white, becauſe the part is in a ſtate of debility; this preference is more to be obſerved in the compound colours, and it is particularly remarked, that the extremities, when not of a dark colour, are more diſpoſed to diſeaſe than others; hence white legs are conſidered as a blemiſh, and thus ſo many cavalry horſes are white legged, and as ſuch are ſubject to greaſe.

SECTION VIII.

The Anatomy of the Horſe.

THIS ſcience teaches the ſtructure, ſituation, œconomy, and uſes of the various parts of the body of this animal, when taken in the moſt extended ſenſe; and in which ſenſe we propoſed conſidering it. It appears beſt taught by conſidering it under ſeveral heads of, as

Oſteology	or doctrine of the	Bones
Syndeſmology		Ligaments
Myology		Muſcles
Burſalogy		Mucous Capſules
Angiology		Veſſels
Neurology		Nerves
Andenology		Glands
Splanchnology		Viſcera
Hygrology		Fluids

In the following anatomical detail, I have adopted in ſome degree the arrangement made uſe of in the elegant elementary work on human anatomy by Dr. Hooper; and I muſt premiſe, that I by no means offer this ſyſtem as without error. The ſcience is but in its infancy; there are but few helps to be obtained, and the leiſure of an individual is by no means ſufficient to the acquiſition of great correctneſs, in ſo diffuſe a ſubject. I have diſſected much, and ſearched for information in every quarter it was to be obtained in; and have drawn it from every ſource open to me, as ſuch, I hope, that in eſſentials, I ſhall not be found materially defective I have, throughout, blended the functions of parts, with their formation; the one illuſtrating the other, and both being eſſential to the art we propoſe teaching.

Oſteology.

Bones are hard, white, inſenſible bodies; upon which the ſoft parts are laid; thereby ſuſtaining, and forming the baſe of the whole animal machine. They are formed of earth and membrane *. The membrane appears firſt in the ſyſtem, and then contains only a jelly, which becomes abſorbed, and the veſſels gradually depoſit the earthy matter in its room.

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* If a bone is placed in marine acid, or, as it is called, ſpirit of ſea ſalt; the earthy part is diſſolved, and the membrane left entire; thus a large bone may be rolled up and placed in a bottle and on pouring in oil of turpentine, or ſpirit of wine, the membrane expands, and ſurpriſes the incautious how it ſhould get there.

" Bones conſiſt chiefly of jelly, fat, and an earthy neutral ſalt. " By diſtillation they yield hydrogen and carbonic acid gas, a " a volatile alkaline liquid, an empyreumatic oil, and dry mild " ammoniac: the reſiduum is a coal, which, prepared, forms " ivory black." *Parkinſon.*

This proceſs is compleated in ſome bones more early than in others, as in the pelvis, and hinder extremities: the extremity of each bone is likewiſe leſs conſolidated than the centre. The depoſit of their earthy part appears to ariſe from the veſſels of the perioſteum, or outer covering of the bones: hence if by any means this membrane becomes deſtroyed, the bone in contact with it becomes carious and dies. This depoſit appears to be haſtened by any thing that permanently quickens the circulation, by occaſioning a more ſpeedy ſeparation of the earthy parts from the veſſels; and hence nature probably gives to young animals their playful diſpoſition, which by encreaſing the flow of blood occaſions a freer depoſit of earthy particles, and an earlier evolution of all their parts: hence likewiſe the inhabitants of warm climates come to perfection ſooner than thoſe of the northern regions. By preternaturally haſtening the earthy depoſit before the membranous part of the bone becomes fully evolved, it is evident that though the bones are conſolidated more early, yet they have not attained their natural ſize; that is, that by this means the growth is ſtopped. Thus we learn the reaſon why horſes early and hard worked, never arrive at their full ſize. It is to this cauſe likewiſe that the ſtinting of the growth of puppies, who are bathed in, and made to drink ſpirits of wine, is to be attributed. Preſſure likewiſe appears to aſſiſt oſſification; thus parts long expoſed to it, become bony; as the cartilaginous ends of the ſpinous proceſſes of the vertebra, from the preſſure of the ſaddle. Whether does the oſſification of other parts, as the blood veſſels, &c. ariſe from long continued muſcular preſſure, or from a ſympathiſing effort of the conſtitution to ſtrengthen a weakened part, by a more ſolid ſtructure? From this preſſure, perhaps, it is that horſes early worked put out ſplents and ſpavins.

The veſſels of young bones are more numerous than thoſe of old, and thus are redder: having both increaſe and ſupport to perform, it was neceſſary they ſhould be furniſhed with blood in great plenty. The growth of bones, Mr. Hunter ſuppoſed, was occaſioned by two proceſſes going on at the ſame time, and aſſiſting each other; the arteries bringing the ſupplies to the bone for its increaſe; the abſorbents at the ſame time are employed in removing portions of the old bone, ſo as to give the new a proper form, by which means the bone becomes larger, without having any material change produced in its ſhape. Dr. Monro and Du Hamel, ſuppoſed that bones grow by an extenſion of their parts in every direction.

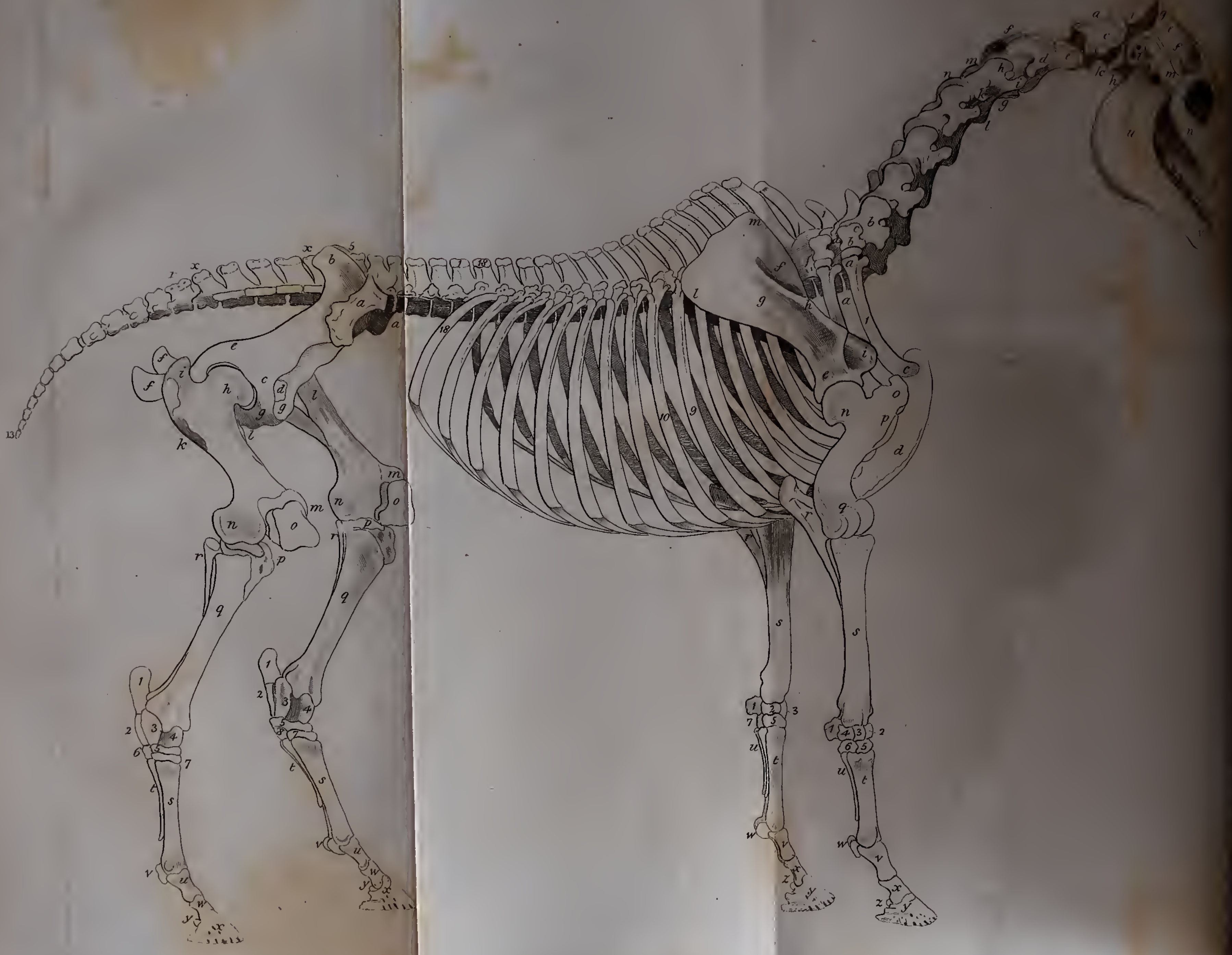
The earth of bones is continually changing, and freſh depoſiting in its room; this change is effected by their abſorbing veſſels. That ſuch a change is continually going on is evident, for food of a particular colour, as madder, will tinge the bones of animals red; and when it is left off, the bones come gradually to their original hue. It is by this abſorbing proceſs that dead carious bone becomes ſeparated from the living. The earthy matter of bone appears depoſited in fibrous layers, beginning in the centre of the bone, and as they approach the outer part, becoming infinitely more compact. By the diſpoſition of the inner fibres the internal part is cavernous, but not entirely hollow, as it appears in a dried bone. This cavernous part is lined by a membrane, which is called the internal perioſteum, but it appears intended to retain the *medulla* or *marrow*, which is an oily fluid poured into the cells of this membrane, and is ſecreted from the large blood veſſels that are ſeen entering the bones. The marrow being thus ſuſtained in cells by the cancelli, is prevented from gravitating. The uſe of this oily depoſit is ſuppoſed to be ſimilar to that of the general fat of the body, as a general reſervoir for ſupport: but it would appear, I think, that it muſt have ſome other uſes connected with the bones themſelves, or there would not be ſuch powerful veſſels go to furniſh it; and as we know how difficult it is to form a compleat cavity or vacuum, what becomes of the cavernous portion of the bones, when this marrow becomes abſorbed in long abſtinence, with the other fat of the body? The marrow itſelf is inſenſible, but the membrane containing it is highly ſenſible. Bones themſelves, though furniſhed with nerves, are not endowed with much feeling but under inflammation; yet the teeth have a ſpecies of ſenſibility at all times. As being but little vaſcular, the living power of bones is ſmall, hence they, with difficulty, take on diſeaſe; but when once become ſo, from the ſame reaſon, they are leſs readily reſtored than more vaſcular parts. But a diſpoſition to oſſific inflammation, and a throwing out of bony matter, is more frequent in the horſe than any other animal we are acquainted with. Bones, to increaſe the ſurface of attachment of tendons, and to remove the axis of the tendons farther from the centre of motion, have frequently bony appendages, termed *epiphyſes*; which, as being only united to the bone by means of cartilage, have not ſufficient ſtrength to admit of great extenſion or force: but nature, ever ſtudious for the benefit of her children, in ſuch parts as are brought immediately into action at birth, unites theſe epiphyſes into proceſſes before birth, as the condyles of the occipital bone, the heads and tubercles of the ribs, &c. In the adult ſubject, moſt of the epiphyſes of the body become *proceſſes*, and which receive names according to their figure. The part of the former, that articulates with the pelvis, called by the farriers the whirl bone, was once an epiphyſis, but is now an apophyſis or proceſs, and is termed *a head*, as the ſmaller part below from whence it originates, is called *cervix* or *neck*. If a head becomes flattened, it takes the name of *condyle*; an unequal riſing is named a *tuberoſity*; a ſharp one a *ſpine*; and a ſlighter one a *creſt*. They receive likewiſe the names of *maſtoid*, *ſtyloid*, &c. according to their ſuppoſed forms. The depreſſions and cavities receive appropiate terms alſo; as the deep ones are called *cotylæ*, and the ſuperficial *glenæ*. *Sinuoſities* are broad ſuperficial depreſſions, *foſſæ* are deeper, and *formina* pierce through the ſubſtance. There are likewiſe *pits*, *nitches*, *furrows*, &c. The appendages of *cartilage and perioſteum* we ſhall deſcribe under ſyndeſmology.

The *connection* of bones is termed *articulation*, of which there are three claſſes; *Diarthroſis*, *ſynarthroſis*, and *ſymphyſis*.

1. Diarthroſis or moveable connection, is divided into *enarthroſis*, when the round head of one bone is received into a deep cavity, as the femur with the acetabulum: if a round head is received into a more ſuperficial cavity, it is called *arthrodia*, as the humerus into the glenoid cavity of the ſcapula— *Ginglymus*, when there is only flexion and extenſion. *Trochoides*, when one rotates on another, as the firſt cervical vertebra on the odontoid proceſs of the ſecond. *Amphyarthroſis* is when the motion is very obſcure, as between the bones of the knee and hock.

2. Synarthroſis ſignifies an immoveable connection, and comprehends *ſuture*, which is the indented edges of two bones being received into each other, as in the bones of the ſkull. *Harmony*, when the indentations by which two bones are united, amount only to rough edges, as in ſome of the bones of the face. *Gomphoſis*, the fixing of one bone

into



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into another, as the teeth into the alveoli of the jaw.

3. *Symphyſis*, or mediate connection, is divided into *ſynchondroſis*, or the junction of two bones, by means of an intervening cartilage, as the ſymphyſis pubis. *Syneuroſis*, or ſyndemoſis, when ligaments are the connecting medium. *Syſſarcoſis*, which is not a very definite diſtinction, ſignifies an articulation by means of an intermediate muſcle, as muſt be the caſe in every moveable joint. The ſcapula forms the beſt inſtance of this articulation.

DESCRIPTION OF PLATE I.

Head.

a, *b*, *c*, *d*, os frontis. Only one can be ſeen, the ſuture dividing them, which is the ſagittal, is exactly in front of the head; *a*, the coronal ſuture between *a* and *b*. orbitar apophyſis, with the ſuperciliary foramen on it; *b*, the portion of the frontal forming the orbit; *d*, the portion of it uniting it with malar and palatine bones; *e*, *f*, parietal bone; *e*, its junction with the occipital by the lambdoidal ſuture; *g*, *h*, *i*, *k*, occipital bone; *g*, occipital protuberance; *h*, its cuneiform proceſs; *i*, the condoloid proceſs received into atlas; *k*, the pteregoid proceſs which is peculiar to the horſe. *l*, *m*, Temporal bone, the ſquamous portion is ſeen juſt above the zygomatic arch; joined to the parietal by the ſquamous ſuture; *l*, the petrous portion forming the internal ear; *m*, the zygomatic proceſs forming the zygomatic arch, ſeen uniting with the orbitary proceſs of the frontal, and the zygomatic proceſs of malar by two ſutures; *n*, malar, jugal, or cheek bones; the dark line immediately under is the ſpine which is continued into the maxillary; *o*, os unguis; *p*, *p*, naſal bones; *q*, *r*, *ſ*, ſuperior maxillary; *q*, the portion uniting with malar and palatine bones; *r*, that uniting with malar and angular; the triangular ſpace ſhews a portion of bone that is ſometimes formed between, called os triquetra; *ſ*, the inferior portion uniting the inferior maxillary; between *r* and *ſ*, is ſeen the ſuperior maxillary canal. *t*, the inferior maxillary bone; *u*, *v*, *l*, *m*, maxilla poſterior, or lower jaw; *u*, the branches; *v*, poſterior maxillary canal; *m*, above this and below; *ſ*, the coronoid proceſs paſſing under zygomatic arch.

Vertebra.

a, *b*, the ſeven cervical vertebra; *a*, the atlas; *d*, *e*, *f*, dentata or ſecond; *d*, its ſingle tranſverſe proceſs; *e*, its upper oblique proceſs; *f*, its ridge anſwering for a ſpinous proceſs; *g*, *h*, *i*, *k*, *l*, *m*, *n*, third cervical vertebra; *g*, its body; above the letter is the hole for the tranſmiſſion of the vertebral arteries and veins; *i*, *k*, anterior and poſterior tranſverſe proceſſes; between *h* and *i* is a hole through which the cervical nerves comes through; *l*, anterior protuberance in the body; *m*, the ſpinous proceſs; *h*, the upper oblique proceſſes; *n*, the lower oblique proceſſes; 1, 18 marks, the 18 dorſal vertebra; *a*; the body; the ſpace between each is filled by a cartilago ligamentous ſubſtance; *b*, the tranſverſe proceſſes articulating with the head of each rib; *c*, their upper oblique proceſſes; *d*, their lower ditto. 1, 5, the five dorſal vertebra, their tranſverſe proceſſes are very long, but by the fore ſhortening in the perſpective are not very evident in the plate; *x*, *x*, the ſacrum compoſed of five pieces; the ſpinous proceſſes are the only parts diſtinct; the tranſverſe are united into one unequal rough part; 1, 13, the coccygis or bones of the tail; the ſpinous and tranſverſe proceſſes are diſtinct only on the firſt four or five.

Sternum, Ribs, Shoulder, and anterior Extremities.

a, *b*, 1, 9, the true ribs; 10, 18, the falſe ribs; *a*, the head articulating with the tranſverſe proceſs of firſt dorſal vertebra; under is ſeen the lower branch of the head that unites with the ſeventh cervical and firſt dorſal vertebra; *c*, the end that unites with ſternum; *d*, the ſternum; *e*, *f*, *g*, *h*, *i*, *l*, *m*, the ſcapula, *e*, its neck, below which is ſeen its glenoid cavity; *f*, antea ſpinatus foſſa; *h*, its ſpine, which in the human ends in the proceſſus acromion, but as there is no clavicle in the horſe it ends by a tuberoſity; *i*, coracoid proceſs; between *m*, and *i*, the anterior coſta; *l*, between this and *e*, poſterior coſta; between *m* and l, is its baſe, and the line above it marks the extent and ſituation of the cartilage of ſcapula; *n*, *o*, *p*, *q*, humerus or arm, *n*, its cervix, above which is ſeen its head; *o*, its anterior head, forming the point of ſhoulder, as it is uſually called, in the horſe; *p*, its tuberoſity; *q*, its lower head, behind is ſeen the cavity for the reception of the olecranon; *r*, *r*, ulna; the upper part forms the olecranon or elbow; the lower part is united by ligamentous fibres to the radius; *ſ*, *ſ*, the radius; 1, 2, 3, 3, 4, 5, 6, 7, the carpus or knee; 1, 1, piſiform; 2, 2, ſcaphoid; 3, 3, lunare; 4, unciform; 5, magnum; 6, cuneiform; 7, trapezoid; *t*, *u*, metacarpus; *t*, canon; *u*, two ſmall metacarpals; *v*, *w*, *x*, *y*, *z*, phalanges; *v*, firſt phalange or paſtern; *w*, ſeſſamoids; *x*, coronet bone, or little paſtern; *y*, coffin; *z*, navicular or nut bone.

Pelvis and poſterior Limbs.

a, *b*, *c*, *d*, *e*, *f*, *g*, the two oſſa innominata; *a*, *b*, *c*, ilium; *a*, tuberoſity of ilium, forming the haunch or hip; *c*, the union with iſchium; *e*, *f*, iſchium; *g*, *g*, pubis; and between the letters, the ſymphyſis; *d*, foramen thyroideum; *h*, *i*, *k*, *l*, *m*, femur or thigh bone; *h*, the cervix, above which is the head received into the acetabulum of the pelvis; *i*, great trochanter; *k*, the outer trochanter; *l*, *l*, the inner trochanter; *m*, *m*, the anterior condyles; *n*, *n*, the poſterior ditto; *p*, *p*, ſemilunar cartilages; *o*, *o*, patella; *q*, tibia or leg, commonly called the thigh; *r*, *fibula*; the tibia is ſeen terminating in its maleoli, to articulate with the tarſus; 1, 2, 3, 4, 5, 6, 7, 8, tarſus or hock, 1, 2, 1, 2 calcis, forming the point of hock, in man the heel; 3, 4, aſtragulus; 5, 5, cuneiform magnum; 6, cuboides; 7, cuneiform medium; 8, cuneiform parvum. *ſ*, *ſ*, *t*, *t*, metatarſus; *ſ*, *ſ*, canon or ſhank; *t*, *t*, two ſmall metatarſals; *u*, paſtern; *v*, ſeſſamoids; *w*, coronet bone or leſſer paſtern; *x*, *x*, coffin; *y*, nut or navicular.

A Table of the Bones.

Bones of the Head.	Bones of the ſkull.	Frontal	2
		Parietal	2
		Temporal	4
		Sphenoid	1
		Ethmoid	1
		Occipital	1
	Bones of the face.	Naſal	2
		Angular	2
		Malar	2
		Superior maxillary	2
		Inferior maxillary	2
		Superior palatines	2
		Inferior palatines	2
		Pteregoid	2
		Anterior turbinated,	2
		Poſterior turbinated	2
		Vomer	1
		Poſterior maxillary	1
	Teeth.	Inciſive	12
		Tuſhes	4
		Grinders	24
	Bones of the tongue.	Hyoides	1
	Bones of internal ear.	Malleus	2
		Incus	2
		Stapes	2
		Orbicular	2

Bones of the trunk.	Bones of ſpine.	Cervical vertebræ	7
		Dorſal vertebræ	18
		Lumbar vertebræ	6
		Sacrum	5
		Coccygis	13
	Bones of thorax.	Sternum	1
		Ribs	36
	The pelvis.	Oſſa Innominata	2
Bones of the anterior extremities.	Shoulder.	Scapula	2
	Arm.	Humerus	2
	Fore arm.	Ulna	2
		Radius	2
	Carpus or knee.	Scaphoid	2
		Lunare	2
		Unciform	2
		Piſiform	2
		Trapezoid	2
		Magnum	2
		Cuneiform	2
	Metacarpus.	Canon	2
		Small metacarpals	4
	Phalanges.	Paſterns	2
		Seſſamoids	2
		Small paſterns	2
		Coffin	2
		Navicularis	2

Bones of the poſterior extremities.	The thigh.	Femur	2
	The leg.	Patella	2
		Tibia	2
		Fibula	2
	The tarſus or hock.	Calcis	2
		Aſtragalus	2
		Cuboides	2
		Cuneiform	6
	Metatarſus.	Canon	2
		Small metatarſals	4
	Phalanges.	Paſterns	2
		Seſſamoids	4
		Small paſterns	2
		Coffin	2
		Naviculars	2
		Total	248.

The Cranium or Skull.

The bones of the head are divided into thoſe of the ſkull, face, and poſterior jaw. Theſe bones in the horſe, and other quadrupeds, who have to make conſiderable exertions, as ſoon as born, are oſſified early, which is not the caſe in ſome others. The junction of moſt of theſe bones is effected by *ſutures* which we ſhall not ſeparately deſcribe, as they will naturally appear in treating of individual bones. The uſe of the ſutures muſt be evident, when we conſider what a complex part the head is, and from what a number of points it muſt take its growth, accommodating itſelf by this means to its contents; for it will appear plainly, the ſkull was formed for the brain, and not the brain for the ſkull, which is the occaſion of thoſe numerous indentations throughout theſe bones.

The *cranium*, or *ſkull*, is a vaulted cavity for the reception and preſervation of the brain, and is compoſed of ſeveral pairs, and three ſingle bones.

The *frontal bones*, as they unite by age, are frequently, but erroneouſly, deſcribed as a ſingle bone. They are ſituated in the front of the head, (*a*, *b*, *c*, *d*, *Plate* I.) under the part frequently marked with a ſtar; receiving and lodging the anterior and inferior portion of the brain. The two tables of which they are compoſed ſeparate to form two cavities, called the *frontal ſinuſes* *, which are lined by the pituitary membrane. The frontals are united together by a continuation of the *ſagittal ſuture*; laterally they are connected to the malar bones, by the *orbitary proceſs*, forming the *zygomatic ſuture*; inferiorly to the naſal bones, and interiorly to the ethmoid and ſphenoid, by the ſutures of that name. The orbitar proceſs forms the *greater orbitar foſſa*, or cavity over the eye; in this proceſs (*ſee plate of ſkeleton between* a *and* b, *bones of head*) there is a nitch or hole, called the *ſuperciliary foramen*, giving paſſage to a branch of the fifth pair of nerves and blood veſſels, furniſhing the ſupercilia, and parts adjacent *.

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* Theſe cavities La Foſſe directs to be opened, in his treatment of glanders, by the trepan. They are ſometimes found filled with worms, particularly in oxen and ſheep, *œſtrus ſinus frontis ruminantium.* Should a fracture of the frontal bones happen, which is not unfrequent from kicks, theſe cavities would probably be opened into, but the inner table eſcape; under which circumſtances, neither ſo much caution would be neceſſary in elevating the bones, nor ſo much danger incurred.

The *parietal* bones are ſquare-like; externally uniformly convex, internally concave, lodging the principal part of the brain. They are placed between the temporal, frontal, and occipital bones; and unite together by the ſagittal ſuture, and to the frontal by the *coronal*, and laterally to the temporal by the *ſquamous* ſuture; internally at their union, there is a riſing that extends likewiſe down the ſame union of the frontal bones, which gives attachment to the falx of the brain. Externally, they have a ridge at their union, which is continued up to the occipital, giving attachment to the muſcles of the ear (*e*, *f*, *Skel.*).

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* This proceſs forms the eye-pit, which, in young horſes from being filled with fat, is ſcarcely perceptible. It was uſually ſuppoſed impracticable to perform either the operation of couching or extracting, from the great ſtrength of the retractor muſcle; but by making an opening under this proceſs, the globe of the eye may be ſecured; the real impracticability conſiſts in the derangement of the internal parts of the eye.

The *temporal* bones are divided into two portions, a ſquamous and a petrous, which in the human are united, but in the horſe remain always diſtinct*; thus, there are in fact, four temporal bones. Conſidered as they are uſually, one pair of bones, each has a ſingle cavity, and is very irregular in figure, uniting with all the bones of the ſkull but the ethmoid. The *ſquamous portion* is united to the parietal by the ſquamous ſuture, and has a large peculiar proceſs, called the *zygomatic*, which is contributing with a leſſer one of the malar bone, to form the *zygoma*, or *arch of the cheek*†: nearly at the root of this proceſs is a protuberant cartilaginous cavity, articulating with, and receiving the condoloid proceſs of the lower jaw. Within the *petrous portion*, which is ſituated at the root of the outer ear, is a diſtinct cavity to each, forming the internal ear. They have two *maſtoid proceſſes* near the baſe of the pteregoid proceſſes of the occipital bone, which give origin to the trachelo maſtoideus, or little complexus muſcle (*k*, *l*, *m*, *Skel*).

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* Mr. Stubbs by carrying the analogy with the human too far, has deſcribed theſe as united portions.

† Under this arch paſſes the coronoid proceſs of the lower jaw; if, therefore, the arch ſhould become fractured, ſo much bony matter might be thrown out as to interfere with the motion of this proceſs, or to injure the articulation of the condoloid proceſs. Should ſuch a caſe occur, the looſe pieces of bone ſhould be immediately removed, if they cannot be exactly replaced, to prevent this.

The *ſphenoid* is a very irregular bone, and connected with all thoſe we have deſcribed, to which it is as it were a key. It preſents ſeveral proceſſes, the two moſt conſiderable of which are called its *alæ* or *wings*; two others are its *orbitar apophyſes*; it has likewiſe others called its *cuneiform*, *occipital*, and *temporal proceſſes*. It has within its body a cavity, called *ſphenoidal ſinus*, and which communicates with the ethmoidal cells. It is connected to the cuneiform proceſs of the occipital, ſuperiorly and poſteriorly to the ethmoid and the vomer, which reſts upon it; inferiorly and poſteriorly to the ſquamous portions of the temporal, and to part of the palatine bone.

The *ethmoid* of the horſe, is very different from the human; forming in this ſubject a very conſiderable bone, and which from an intermediate plate or ſeptum, called *chriſta galli*, has been deſcribed as two bones: it is ſituated under the ſuperior part of the naſal foſſa, between the frontal and ſphenoidal bones. It is made up of numerous cells of very irregular figures and direction, but which are all lined with the pituitary membrane *, and communicate with the frontal ſinuſes, terminating in the anterior turbinated bones. The *ſella turſica*, a cavity lodging the pituitary glands, which in the human is in the ſphenoid, in the horſe is a part of this bone: its orbitary proceſs likewiſe forms the ſuperior optic foramen, which in the human ſubject is formed by the ſphenoid.

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* The ethmoidal cells in glanders are frequently filled with matter; and the ſame occurs in dogs who have the diſtemper in a violent degree, and long continued.

The *occipital* is called by farriers the *knoll bone*, and is ſituated at the ſummit of the head; (*vid.* *g*, *h*, *i*, *k*, *Plate* I.) and is the largeſt of the bones of the ſkull, articulating with the parietals by the *lambdoidal ſuture*, to the temporals by their petrous portion, and by its cuneiform proceſs to the ſphenoid. It is in the fœtal ſtate compoſed of ſeveral parts. Internally it lodges the ſuperior lobes of the brain, the cerebellum reſting on a prominence ariſing from the lambdoidal ſuture, called the *crucial ridge*, from which likewiſe the dura mater ariſes, running ſuperiorly and anteriorly to be attached to chriſta galli of the ethmoid. It is this part of the dura mater that forms the ſinuſes: laterally the occipital attaches the tentorium. It is a very irregular bone, wholly unlike the human, ſuperiorly riſing into a ridge, or perpendicular proceſs, to which the cervical ligament or fix fax of the neck is attached. Its inferior ſurface has ſeveral proceſſes and eminences, two of which ariſing from the poſterior part of the bone, and giving very advantageous attachment to muſcles, are peculiar to the horſe, or at leaſt do not exiſt in the human: they have been called ſtyloid, but are more properly the *pteregoid proceſſes*

(vid.

(*vid. k, Plate* I.) The *condoloid apophyſes* articulate with the atlas: but the principal proceſs is the *cuneiform*, which is very large (*vid. h, Plate* I.), and received as a wedge among the bones of the ſkull. Its principal cavities are the *foramen magnum*, giving paſſage to the ſpinal marrow, and the *condoloid foramina*, penetrating the condoloid apophyſes *.

From this deſcription it will appear, that the bones of the ſkull might in number be made to ſuit the convenience of the deſcriber. It is uſual to reckon nine, but in young horſes there are eleven, and in old horſes ten; for the frontals unite into one by age: but as it is not uſual to conſider the temporals, though formed of two diſtinct portions, but as a pair of bones, ſo old horſes are ſaid to have the ſkull formed of eight bones, and that of young ones of nine. Conſidering, however, the temporals as two pair of bones, the ſkull of an adult horſe is compoſed of eleven bones. The ſkull is now and then fractured from blows, more frequently from kicks: an inſtance lately occurred of a blood mare, who, in ſlipping in the Strand, made ſuch exertions to ſave herſelf, that the occipital bone was abſolutely forced into four or five pieces, by the contraction of the muſcles of the head and neck: ſhe fell ſenſeleſs, and remained in that ſtate many hours, and then died. In caſes where death does not immediately follow a fracture, the raiſing the depreſſed bones, if there are any, ſhould be attempted. See *Remarks on Fractures.*

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* The occipital bone is liable now and then to become diſeaſed from fiſtulous ſinuſes forming in pole evil; more particularly when this diſeaſe has continued a great length of time, and been injudiciouſly treated. It is exactly at the poſterior part of this bone this diſeaſe ariſes, apparently from ſome injury to the mucous capſules of the part, for the cervical ligament alone, would not be ſo prone to take on inflammation one muſt ſuppoſe.

Bones of the Face.

The face becomes in animals one of the principal characteriſtic differences in form, between them and the human; being wiſely in both adapted to their various habits and manners. The length of the face is brought about by the greater extent of the bones forming it, and by the addition of another pair of maxillary bones, by which means ſome very wiſe ends are anſwered. In an animal intended to graze, or to apply his mouth to the ground for the purpoſe of reaching his food, or his noſe to ſearch for it, was it not for the great length of his jaws, his neck muſt be ſo long as to remove his head too far from the centre of motion, and by acting on too long a lever, greatly fatigue it. Another is the increaſe of ſurface in the organ of ſmell, which, in animals whoſe whole powers nearly, of diſtinguiſhing noxious from innoxious ſubſtances, reſides in this organ, was eſſentially neceſſary. In the ape tribe, the face is not unlike our own; for this animal carries his food to his mouth with his paw.—The bones forming the face, including the poſterior jaw, may be conſidered as ten pairs, and two ſingle ones, which are all uniting together by future, or *harmony*; which latter differs from the former only in as much as the one unites by ſaw-like proceſſes, but this by rough edges.

The *naſal* bones reſemble, in ſome meaſure, a reverſed pyramid, forming below a point (*vid. p, Plate* I.) unconnected with any other bone. They are united together throughout their whole length: this union internally forms a groove, into which the cartilaginous *ſeptum narium* dividing the noſtrils is received. Theſe bones are ſituated in front of the face, and are connected interiorly with the anterior turbinated bones; ſuperiorly with the frontals; ſuperiorly and laterally with the angulars; and inferiorly with the lower maxillary. The *naſal foſſæ* are formed of theſe bones in conjunction with the maxillaries laterally; ſuperiorly of the poſterior table of the frontals, forming the frontal ſinuſes, with which they communicate; and poſteriorly of the palatine bones *,

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* Theſe naſal cavities being lined by the pituitary membrane, conſtitute the principal ſeat of glanders; in ſome inſtances there is a depoſit of bony matter within from this diſeaſe. The naſal bones are expoſed to fracture, gun-ſhot wounds, or cuts of the ſabre; in which caſes, unleſs the management is judicious, by promoting a ſpeedy cure, and preventing inflammation, glanders may be the conſequence.

The *angulars*, or *oſſa unguis*, from their ſuppoſed reſemblance to a human nail, are in the horſe wholly oſſified, and ſituated at the inner angle of the eyes (*vid. o, Plate* I.), forming a conſiderable portion of the orbits. Each is nearly ſquare, and is joined to the naſal, malar, frontal, and ſuperior maxillary, and is ſo formed as to preſent an inner, outer, and orbitary ſurface: between the outer and orbitary ſurfaces, is the orbitary ridge: the latter of theſe ſurfaces is perforated by a canal, juſt within the inner angle of the eye, forming the *lachrymal duct*, or *ductus ad naſum*, carrying off the ſuperfluous tears into the noſe. This duct paſſes bony between the turbinated bones, and then becomes membranous under the inferior or poſterior of them *. On the outer ſurface of the unguis is ſeen the *angular pro-*

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* In virulent glanders this duct becomes obſtructed at its lower portion from the general inflammation, and at length diſeaſed throughout, when matter flows out at the ſuperior opening, and the tears fall over the cheek. French authors inſiſt likewiſe much on *fiſtula lachrymalis* in other caſes, but of which I never ſaw an inſtance, though it may certainly exiſt. La Foſſe directs in this caſe, to firſt inject from below upward, that is, to place a ſyringe within the naſal opening, which is eaſily ſeen at the poſterior part, or almoſt the beginning of the noſtrils, and endeavour to paſs the liquor through the orbitar opening: ſhould this not ſucceed, he propoſes the introduction of a grooved canula, and a ſection made on that, to dilute the canal, and reduce the obſtruction: but the cure for this complaint in the human ſubject, has ſucceeded by the introduction of a ſilver pipe into the duct, of ſuch a ſize as not to irritate its internal ſurface.

ceſs, a ſmall riſing giving attachment to a muſcle of the noſe.

The *malar*, *jugal*, or *cheek* bones, occupy the poſterior part of the orbits, (*vid. n*, *Plate* I.) between the angular, ſuperior maxillary, and temporal bones; to the laſt of which each is united by its temporal proceſs, which is forming part of the zygomatic arch. From this a conſiderable ſpine extends downwards, and is continued in the maxillary bone, to which the maſſeter muſcle is attached: immediately under this ſpine runs the temporal artery and vein. Theſe bones likewiſe form a part of the orbitary foſſa, and internally have a hollow, named the zygomatic ſinus, which is conſiderable, but appears ſhut out from communication with the other ſinuſes.

The *ſuperior maxillary* bones are the largeſt of thoſe ſtrictly forming the face, and are connected anteriorly to the naſal; inferiorly to the inferior maxillary; and internally to each other, and to the palatine by their palatine proceſſes, where there is a foramen for the paſſage of the palatine artery: they are connected alſo to the vomer, and within the orbit to the zygomatic proceſs of temporals. Each preſents an external, an internal, and a palatine ſurface. The exterior is convex, and has upon it the maxillary ſpine continued from the malar: midway between this and its junction with the naſal bone, there is a foramen continued through each of them, tranſmitting the ſecond branch of the fifth pair of nerves

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with ſome veſſels, all which go to ſupply the molar teeth: this is called the *anterior maxillary canal.* Its inferior edge is pierced by the molares. By their junction with each other poſteriorly, they form the inferior portion of the palatine arch, or roof of the mouth; the ſuperior part of this arch is formed by the palatine bones themſelves, to which the maxillary are united. At the inferior portion of this arch, theſe bones recede as it were to give place to a pair of bony plates, which, as they appear in a great meaſure diſtinct, ſhould be called, I think, inferior palatines. The cavity formed by the internal ſurface of each of the maxillary bones lodges the turbinated, with which the cavity is nearly filled: therefore, what has been deſcribed by authors as maxillary ſinuſes, and ſo much inſiſted on by La Foſſe, are in fact *turbinated* ſinuſes. (*vid. q, r, s, Plate* I.

The *inferior maxillary* bones have been by the French authors overlooked, being conſtantly conſidered as part of thoſe above, though the diviſion is as evident, as between the frontals and parietals, or any bones whatever. Mr. Stubbs likewiſe falls into the ſame error. Theſe bones are wanting in the human, and are peculiar to animals with long jaws, uniting together by ſymphyſis, and to the inferior maxillary and naſals by harmony. They concur in forming part of the naſal foſſa, and at their inferior edge have ſix *alveoli,* lodging the anterior inciſive teeth. The tuſh is ſometimes lodged in the poſterior edge of this, and ſometimes in that of the ſuperior maxillary. At the ſymphyſis is a foramen giving paſſage to veſſels and a nerve. (*Vid. t*, *Skel.*)

The *ſuperior palatines* are ſituated at the upper part of the bony palate, beyond the ſuperior maxillary, to which they unite, and jointly form the arch of the palate: ſuperiorly they unite to the wings of the ſphenoid, and leave an oval opening between them and its body, which forms the entrance of the naſal foſſa into the pharynx. To their edge is attached the velum palati, dividing the pharynx from the mouth: they are connected to the vomer and ethmoid, and form a *canal*, called the *palatine*, which is continued in the palatine portions of the ſuperior maxillaries, and gives paſſage to the nerves and veſſels of the palate.

The *inferior palatine* bones. I believe I am ſingular in conſidering theſe as diſtinct from the ſuperior maxillaries, with which they are uſually deſcribed, and conſidered as portions of, though I think they merit this diſtinction, and as ſuch I have introduced it: they are ſmall frangible plates; their greateſt portion being received between two receding portions of the ſuperior maxillaries, but now and then their inferior part is received between ſimilar portions of the inferior maxillaries.

The *pteregoid* are two ſmall crooked bones, about which likewiſe authors differ. Bourgelat conſiders them as portions of the palatine bones; by others they are deſcribed as their ſtyloid proceſſes: but they may be regarded as detached diſtinct bony portions, ſituated between the vomer and palatines, forming a cartilaginous ring, through which paſſes the tendon of a muſcle of the palate.

The *anterior turbinated* bones are thin, bony, lamella, that occupy part of the ſpace formed by the cavity within each ſuperior maxillary bone; they are connected with the naſal bones, of which they are by ſome authors deſcribed as a part, and receive the continuation of the ethmoidal cells, and are ſeen on opening the noſtrils, forming a ſpecies of tortuous cavity.

The *poſterior turbinated* bones occupy the remainder of the cavity of the maxillary bones, and by their mutual tortuoſities in theſe, have been called by the French the inferior cornets of the noſe, as the anterior are called the ſuperior cornets. The turbinated bones are very ſpongy, and ſlight in their texture, being ſieve-like, and have ſometimes in glanders become abſorbed: their uſe appears to be the encreaſing the ſurface of the pituitary membrane, which is the reaſon they are ſo conſiderable in animals, and ſo trivial in man.

The *vomer* is ſo called from its ſuppoſed reſemblance to a plough-ſhare, extending from the inferior part of the naſal foſſa to the ſphenoid bone, perpendicularly placed below, but horizontally above, ſo as to divide, in conjunction with the cartilaginous ſeptum, the noſtrils into two equal cavities;

ſuperiorly it joins the ſphenoid, and inferiorly is received into a groove of the palatine proceſs of the maxillary bone: it is likewiſe connected with the ethmoid.

The *poſterior maxillary* bone, or *lower jaw*, is compoſed of two pieces, intimately united by ſymphyſis at the chin. Each of theſe portions form an inner and outer ſurface, and an anterior and poſterior edge. The anterior edge, by a ſeparation of its tables, forms the *alveoli* for the reception of the molares or grinders, the tuſhes, and inciſive teeth. The inner ſurface preſents a foramen, called the *poſterior maxillary canal*, which gives a paſſage to the third branch of the fifth pair of nerves, and to an entering artery, and a returning vein, furniſhing the teeth with nouriſhment. Both inner and outer ſurfaces are ſtrongly marked with muſcular attachments. The inferior part of the anterior edge forms the *bars* on which the bit reſts. At the ſuperior portion, this bone on each ſide turns up into two conſiderable branches; the external angle of each of which is the thickeſt of the whole, and is called the tuberoſity: the branches end in two proceſſes with an intermediate groove. The firſt and moſt ſuperior of theſe, is called the *condoloid proceſs*, and forms a flat head tipped with cartilage articulating with a cartilaginous depreſſion of the zygomatic proceſs of the temporal; (*See Skel.*) between which articulations is placed, as in the human, a moveable cartilage, accommodating itſelf by its figure to the motions of the jaw. The ſecond is the *coronoid proceſs*, and is flat, paſſing under the zygomatic arch, (*Vid. f and m*, *Skel.*) and having the crotaphite muſcle inſerted into it. From this, the uſe of this arch, which without attention is obſcure, becomes evident: was it not for this guard, every accidental preſſure, and every ſlight injury, would impede the motion of the jaw, and by this means ſtarve the animal. The whole likewiſe of this bone ſhews the moſt admirable mechaniſm: the molar teeth, on whom moſt is dependent, and whoſe exertions are greateſt, are placed neareſt the centre of motion: and as the upper jaw in moſt animals is nearly fixed, ſo it was neceſſary the lower ſhould have conſiderable extent of moving power for the purpoſe of grinding, and it is accordingly ſo formed as to admit of motion in every direction. The condoloid proceſs is attached to the temporal bone by a ligament, which inſerts itſelf behind the zygomatic proceſs, and by a large capſular ligament. On the contrary, the coronoid proceſs is attached by means of the crotaphite tendon: had this been a ligament as well as the former, the mouth could not have been opened ſufficiently, as in the act of gaping; and without this additional attachment, the condoloid articulation would not have been ſufficiently ſtrong. A diſlocation of this bone is no unuſual thing in the human, but is in the horſe, ſeldom or never happening, not only from the great ſtrength, but the different poſition of the bone. That part of it forming the bars, is not unfrequently becoming carious from wounds of a ſharp bit: when this takes place it is ſeldom curable. This bone is not conſidered in anatomical deſcriptions as belonging to the face; but there is no reaſon why it ſhould not at leaſt accompany the deſcription of theſe bones, with which it is ſo intimately connected.

The *os hyoides* is compoſed of five bony pieces, which are ſo diſtinct, that it has been by ſome deſcribed as five bones. It is ſituated at the root of the tongue, and articulates with the ſkull by means of the temporal bone; by which it is rendered very uſeful as an attachment to the muſcles of the tongue, and of the larynx and pharynx (*Vid. i, i, Plate* III. *fig.* 2.) It is divided into a body, two larger, and two leſſer branches. The body forms a ſpecies of croſs, that articulates with the firſt cartilage of the larynx, and then gives an appendix pointing towards the teeth, to which the tongue is attached. On each ſide of this are the little branches uniting with the body by a moveable articulation, and to theſe the large branches unite by an acute angle, and enlarging, extend up into the head, within the membranous cavity of the euſtachian tube, (*Vid. d, fig.* 1. *Plate* III.

Deſcription of the Teeth, and mode of judging of the age of the horſe, ox, and ſheep.

The *teeth* are the hardeſt and compacteſt bones of the body, and are ſituated in cavities between the tables of the jaw-bones, which are called *alveoli:* they are uſually forty in number in the horſe, (and thirty-ſix in the mare,) the latter commonly wanting the tuſhes, though now and then they are preſent. They are divided into *inciſores*, *cuſpidati*, and *molares* *, or, as they are called by farriers and horſemen, *nippers*, *tuſhes*, and *grinders*. Each tooth is formed of a crown, neck, and root. The crown is the upper part, compoſed of a ſhining compact portion, called enamel, and one leſs ſo, of the nature of common bone: the neck is not very evident in the adult horſe, but is more plain in the colt. The roots are received into the alveoli, and are not ſpread out into diſtinct fangs as in the human, but are more cone-like.

Moſt quadrupeds have during life two ſets of teeth, a *temporaneous*, or *milk ſet*, and a *permanent*, or *adult ſet* †. The firſt uſually appears at, or ſoon after birth, the other about the adult period. This change, by which the milk are diſplaced for the permanent ſet, is very gradually performed, ſome years elapſing between the appearance of the firſt and the laſt, by which means the animal ſuffers no inconvenience; were they all, or even ſeveral of them, to remove at the ſame time, the animal would probably ſtarve *.

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* There is now and then ſeen a ſmall tooth near the firſt molar, which farriers call wolves' teeth, but which are evidently a ſpecies of *bicuſpides*.

† The elephant, the hog, and we have reaſon to believe ſome few other animals, continue the milk ſet of teeth through life. Quere,

It is a curious fact, that though the two ſets of teeth appear, with an interval of ſome years between them, yet that the rudiments of both are formed nearly at the ſame period; at leaſt we know, that

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Quere, Would the drawing of a hog's tooth produce another? it is reaſonable to ſuppoſe not. The matter forming the teeth of the elephant, appears in many reſpects diſſimilar to common bone, or to the teeth of other quadrupeds; and the proceſs of teething is alſo ſaid to be different: his teeth are likewiſe placed in a peculiar bony caſe, and not lodged in the alveoli at once as is uſual.—*See Home's Communications in the Phil. Tranſactions.*

* It is not eaſy to account for the great irritation occaſioned by the proceſs of teething in the human infant, while no inconvenience is felt by the animal: there does not appear to be any particular variety in the diſtribution of the nerves to theſe parts; both are furniſhed from the ſame ſource, and through an anterior and poſterior maxillary canal, or ſuperior and inferior. We muſt perhaps ſeek for the reaſon in that great law in nature, that in proportion as a machine is more complex, its imperfections are greater; had the ſame difficulty of teething prevailed in brutes, it is evident, moſt of them muſt have died; as at this period they uſually derive a very conſiderable part of their nouriſhment, from the ſame ſubſtances with the parent.

as ſoon as the temporaneous are evident, the traces of the other can be diſtinguiſhed immediately under them, and only are prevented from making their appearance apparently by the preſſure occaſioned by the firſt: thus, when one of the firſt ſet is drawn, its place is ſoon filled up by one of the ſecond ſet; and this appears the reaſon of their early formation, that they may be always ready to fill up any accidental diſplacement that may occur before the uſual period. Was this not the caſe, another could not afterwards appear; for nature, who makes nothing in vain, and never keeps a uſeleſs part, as ſoon as a tooth becomes diſplaced, if another is not immediately ſpringing up, the abſorbents remove the aveoli, or ſocket in which it was placed, levelling it ſmooth, that it may not by its ſharp edges wound the gums. Dealers know this early appearance of the ſecond ſet when the others are removed, which they frequently practiſe to make young horſes appear older than they are.

It was eſſentially neceſſary there ſhould be two ſets of teeth, for as they grow but ſlowly in proportion to the jaws, ſo, had there been but one ſet, the diſproportion in growth between the teeth and jaws muſt have ſeparated, and made them wide apart as the jaws increaſed; hence there is given at firſt a ſmall and leſs numerous ſet, adapted to the ſize of the jaws; but as the rudiments of the ſecond are larger and more numerous, though early formed, ſo they take up more room, and are actually at this early period ſituated within the branches of the poſterior jaw; ſo that theſe neceſſarily evolve only as the jaw lengthens out *. The mode of removal of the firſt is a matter of great curioſity likewiſe, and is occaſioned by an abſorption of the fangs or roots of the tooth, whereby it falls out having now no ſupport: this abſorption is brought about by the ſtimulus of preſſure, which we know excites theſe veſſels moſt powerfully; this preſſure is occaſioned by the tooth underneath: as this ſecond tooth becomes evolved and hardened ſo as to be more hard than the roots of the tooth above, and as by its evolution and growth it preſſes on theſe roots, ſo they become abſorbed; but while it is not perfectly hardened, and does not reach to preſs the temporaneous roots they remain ſecure, and thoſe teeth do their office; and as this evolution in the permanent ſet is different in the different individual teeth, ſo the removal of the temporaneous is ſtimulated at different periods, by which the animal is not illconvenienced as he muſt be if the removal of the whole took place at once. The living powers in the teeth are kept up as in bones in general, by

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* Quere, Does not this throw ſome light on the growth of bones?—On a review of what has been ſaid, one is naturally drawn to admire the wiſdom and beauty in the animal formation; well might it be ſaid, we are fearfully and wonderfully made, and truly might it be remarked, that we are amply paid for our trouble in any reſearch into this entertaining and inſtructive ſubject.

nerves and blood-veſſels, which may be traced entering the hollows in the roots. It is evident, that the veſſels muſt be conſiderable, from the great hæmorrhages that ſometimes follow from the extraction of the human teeth. The nerves enter by means of the anterior and poſterior maxillary canals as we have deſcribed * ; nor have we any reaſon to doubt their having abſorbents; but, on the contrary, we ſee that their growth is increaſed till the adult period, and the roots of the temporaneous removed; and hence there is every reaſon to ſuppoſe their earth is abſorbed, and redepoſited as in other bones, for we find in the human, when a tooth is drawn, the next can branch out ſo as nearly to fill up the ſpace, ſo careful is nature in ſupplying a waſte. The ſenſibility in teeth is well known among ourſelves from the diſagreeable effect of acids, and of certain ſounds ſetting them, as we term it, on edge; the latter muſt ariſe from a peculiar connection between ſome of the auditory branches, and ſome branches of the fifth pair of nerves probably; but many of theſe phenomena are wholly without our reach. The effect of ſand, or other gritty matter, between the teeth, likewiſe demonſtrates their ſenſibility fully, which is alſo evinced by their feeling under inflam-

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* Some of the nervous branches furniſhing the human teeth, are paſſing under the ear above the tuberoſity of the jaw. It is by dividing, or burning the nerve at this part, (a dangerous practice,) that itinerant practitioners pretend to cure the tooth-ach, which in the under teeth ſometimes ſucceeds.

mation ſo much longer *. The teeth of quadrupeds are not ſo liable to a diſeaſed decay as the human, yet now and then it does happen, and a horſe is found with appearance of pain, and a diſlike to the act of eating.

The rudiments of the teeth may be detected very early in the embryo in the form of a mucous, involved in a membrane: bony matter is gradually thrown out in this, and the mucous abſorbed. The *enamel* is a particular depoſit, not following altogether the nature of bone †, and is placed differently in different animals. In the human and carnivorous brutes, it is all placed exteriorly as a covering to the teeth, giving them firmneſs. In granivorous animals, on the contrary, it is placed in perpendicular plates within the body of the teeth, where, by its great hardneſs, it is always keeping up ridges, and a rough grinding ſurface; for, as there is by this means alternately a perpendicular layer of common bone, and a plate of enamel, ſo as the bony part is wearing more readily than this, there is always a number of inequalities remaining on the ſurface of the grinders, admirably adapting them for the purpoſes intended; and by this formation remaining perfect to the laſt period of the animal's exiſtence *.

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* We have caſes related where the filing the teeth (ſo ſtrong is the connection with the ſentient principle,) has occaſioned convulſions; and a child, whoſe gums were lanced for the purpoſe of permitting the freer egreſs of a tooth, juſt ſhivered, and die.

† Mr. Hatchet diſſolved enamel in muriatic acid without heat, by which he found the eſſential principles to be lime and phoſphoric acid; enamel appearing to differ from tooth or bone, by being principally formed of phoſphate of lime, cemented by gluten.

The teeth are the only bones that are without the inveſture of the perioſteum, being in their crown and neck uncovered, but their roots are ſurrounded by the proper membrane of the gums.

The *inciſive* teeth are ſix to each jaw, and in older books of farriery are called, the two front ones nippers, the next gatherers, or ſeparators; and the outer, corner teeth. The French name them *pinces, mitoyenne,* and *coins,* but it would be better to ſay the firſt, ſecond, and third inciſives, beginning at the corner. Theſe teeth are curved, which is favourable for the preſſure they undergo; the upper are more ſo than the lower; they have two ſurfaces, an inner and outer; the inner is rounded, but the outer has a groove up the middle. Their upper ſurface preſents a hollow, which, as it wears away in ſome degree at certain periods, is regarded as a criterion of the age, and, in fact, forms the beſt mode of judging of the number of years the animal has lived, but is a very uncertain one as to his real value. The inciſive teeth differ from each other ſlightly in appearance; the corner ones are nearly triangular (*See Plate* II.); theſe have likewiſe a ſpecies of artificial ſide, or internal wall, which is not on a level with the reſt for ſome time after it appears.

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* We may from hence learn, that the enamel is not for the purpoſe principally of preſerving the teeth, as dentiſts conſtantly inſiſt on: perhaps any particular preſervative quality in it, is one of the leaſt of its uſes, or the teeth would be ſeldom free from decay. In the horſe it is evident there are parts entirely deprived of it, as at the depreſſions on the broad ſurfaces of the grinders, and on the ſurface of the worn inciſive or nippers, yet neither of theſe uſually become carious. In our own front teeth it is the ſame, wearing from an edge to a flattened ſurface by age, but never decaying in this part; when they do, it is begun at the neck where the enamel exiſts; and the firſt carious ſpot that is ſeen in a grinder, is uſually in the deep depreſſions in the middle, where the enamel can ſuffer no abraſion: add to which, that decay in a tooth may generally be ſtopped, if the whole of the decayed portion is filed away. Some tribes of Indians always keep their teeth filed to a point, yet ſeldom is a decayed tooth ſeen amongſt them at the moſt advanced periods. The real and principal uſe of this ſubſtance is by its hardneſs to give firmneſs to the the teeth, and perhaps it has a ſimilar uſe with the cuticle or outer ſkin, to defend the inner ſubſtance of the tooth from external applications, thereby blunting their ſenſibility, which in carious or abraded teeth is very great.

The *cuſpidati, canine,* or *tuſhes,* are uſually wanting in mares, and are four in number, one on each ſide of the upper and lower jaw, in the ſpace between the inciſive and molars. Thoſe of the anterior jaw are uſually nearer the nippers than the poſterior. There are but one ſet of theſe, which appear at the adult period growing ſlowly, and when completely evolved preſenting a curved appearance, turned inwards, with an outer plain ſurface, and an inner one that has two perpendicular grooves, with an intermediate riſing: the end is pointed, which by age wears away along with the internal grooves, leaving the tuſh blunted, and the internal ſurface ſmooth and equal with the outer; this, therefore, may be a guide, when a horſe has been ſuſpected to have been *biſhopped.*

The *molares* or *grinders*, are twelve to each jaw. The upper are larger and ſtronger than the under, as they form the fixed point upon which maſtication is performed. Their upper ſurface preſents nearly a long ſquare, the firſt not ſo compleat as the reſt, being nearly triangular in many inſtances: this ſurface is very uneven from the alternation of the enamel and bony portions; and as the anterior teeth hang over the poſterior, ſo the ridges of the one ſet are received into the depreſſions of the other, by this means permitting the mouth to ſhut completely in a ſtate of reſt. Theſe teeth are now and then becoming carious in horſes, but it is not often occurring: at times likewiſe there is ſituated before the firſt molar, a ſmall bicuſpis, called *wolves' tooth*, which, from the irregularity of its growth, is forced to be removed; but what farriers more uſually term wolves' teeth, is when the teeth wear unequally, and pointed proceſſes remain, which wound the cheeks and gums. Another ſpecies of wolves' teeth is what the French term *ſurdents*, and is a bony exoſtoſis, or diſeaſed encreaſe of ſome one tooth, or part of a tooth. The teeth ſometimes wear away ſo irregular as to prevent maſtication; when this is the caſe, the points ſhould be filed ſmooth, with a rather fine and well hardened file. The breaking them away with a hammer and chiſſel, or the extracting teeth this way, is a very dangerous practice; for, from the great ſtrengthen with which they are implanted in the alveoli, the jaw is uſually more or leſs fractured in theſe caſes. Inequalities ſhould always be filed away, and when it is neceſſary to extract one, it might be done by fixing an inſtrument that could be ſcrewed on, or otherwiſe faſtened on the inner and outer ſides, and then by wrenching this round with moderate force, the tooth would be looſened without endangering the tables of the jaws: for it muſt be remembered, the roots, though equal in number to the human fangs, are yet formed into one cone-like body, conſequently this might be done to more advantage to the horſe than the human.

Of the Teeth, as characteriſing the Age with the auxiliary Marks.

A colt is uſually foaled with ſix grinders in each jaw, three on each ſide.

In ten or twelve days he puts out two nippers in front, above and below.

In a fortnight after, the two middle ones appear; and in two or three months from this, the corner nippers are puſhed out.

From this, till he is a year old, no great changes takes place, except that the cavity in the nippers begins ſlightly to fill up, and appear worn, and the neck of each tooth is particularly diſtinct. He has likewiſe now four grinders on each ſide above and below, three of the milk ſet, and one permanent.

At a year and a half the cavity in the nippers is nearly filled up, and he has now three milk, and two permanent grinders in each jaw above and below.

At two years, what little remains of mark was in the nippers is now effaced, and they appear like the ſame teeth in an eight year old horſe: at this time likewiſe, the firſt milk grinder above and below falls.

About two years and a half, and always before he is three, the two front nippers fall out, and as the permanent ones are ſome little time coming to perfection, a colt experiences ſome difficulty in grazing: it might be proper, therefore, at thoſe times, to give him ſome cut food.

Between the third and fourth year, uſually about three and a half, the two next nippers appear above and below, and the ſecond milk grinder diſappears about the ſame time, leaving him now ſix molar teeth on each ſide above and below, one colt, and five of the permanent ſet.

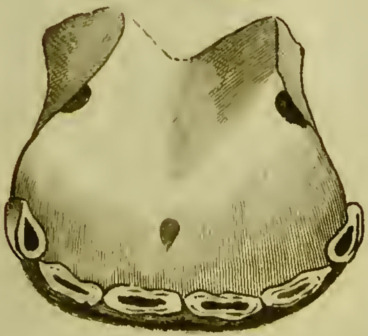
About four and a half, the two corner nippers fall out to give place to the laſt ſet. The laſt milk grinder likewiſe does the ſame, and ſoon after the tuſhes appear. From this time he is no longer called a *colt*, but a *horſe:* and if it is a female, on the falling of the corner nippers, ſhe drops the name of *filly*, and aſſumes that of *mare*. It is about this time a horſe is ſuppoſed to be becoming uſeful, arriving at his ſtrength, and being capable of enduring ſome fatigue; and, as till this period, he is objected to for the purpoſes of utility, ſo it becomes a matter of ſtudy with dealers poſſeſſing colts, to make them appear older than they are really. It is, therefore, very common for them in a promiſing well-grown colt, leſs than four years old, to draw out the corner milk teeth, on which the horſe teeth below appear ſoon after; the reaſons for which we have before explained: they likewiſe, at the ſame time, cut the bars to produce the tuſhes; and when ſuch a colt is docked and nicked, it is not eaſy to detect the deception: but if to an examination of the uſual appearances, is added an obſervance of the grinders, the impoſition may be diſcovered: neither can the animal gain the true appearance of the age they wiſh, unleſs the front nippers appear filling, and the corner ones are nearly equal with the reſt.

At five and a half, in a natural ſtate, the internal wall of the corner nippers is on a level with the reſt, and the tuſhes are compleatly come out, which now preſent a pointed body curved inward, with the outer ſurface round and ſmooth, but the inner ſurface concave and grooved. (*See Plate* II.)

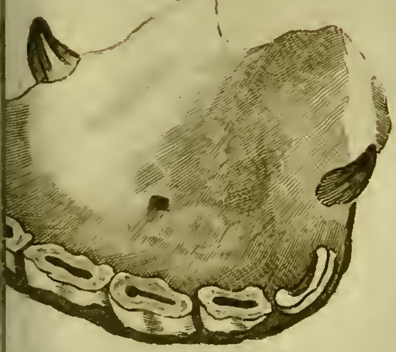
At ſix years old, in general caſes, the black mark or cavity in the two front lower nippers, which was before

Plate 2

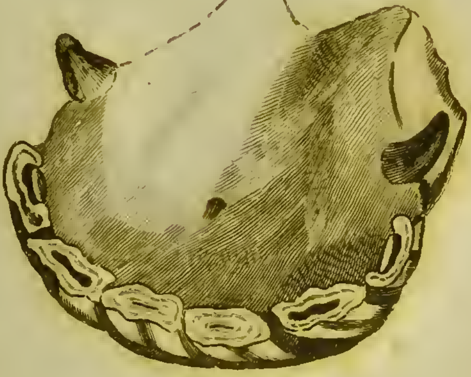
Colts Teeth.



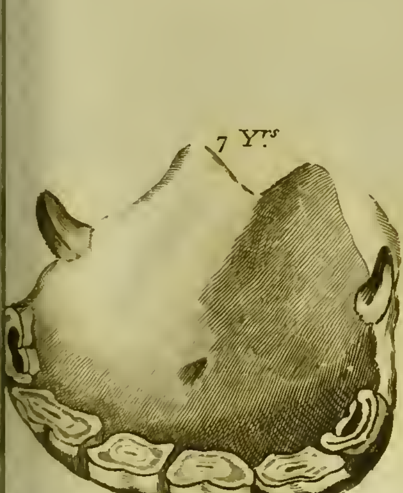
5 Years.



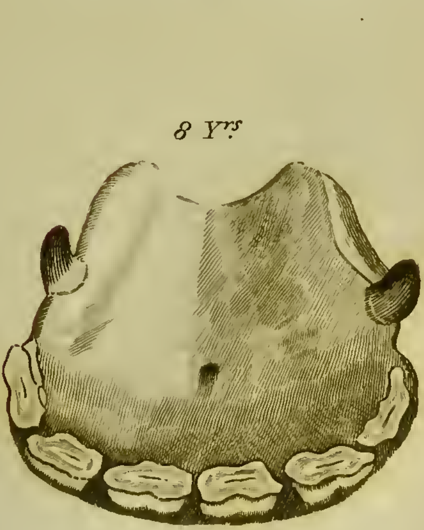
6 Y^{rs}



7 Y^{rs}



8 Y^{rs}



before wearing, now becomes completely effaced. (*Vid. Plate* II.)

At ſeven the ſame mark or cavity in the two next, or intermediate teeth of the poſterior jaw, likewiſe is completely worn out, and the tuſhes appear ſomething blunted. If a horſe has been early and hard rode, he has uſually windgalls, knuckles over, or has ſplents or ſpavins.

At eight, the cavity in the lower corner teeth is loſt, and now a horſe is ſaid to be aged, and to have loſt his mark. But theſe cavities in the upper nippers are found to diſappear more ſlowly, and at eight, when the whole of the others have become effaced, only the two front upper ones are filled. The late profeſſor of the veterinary college, Monſieur St. Bel, was the firſt who introduced here the mode of judging of the age after this period by the upper teeth, which he gained from the riding-houſes in France, where this mode is much depended on. He taught, that two years elapſed between the diſappearance of each of the next pairs; that is, that as the front upper nippers were found filled up at eight, the two next were filled at ten, and the two upper corner loſt their mark when the animal was twelve. But though the cavity in theſe teeth diſappears, ſomething like the above, they do not do it with ſufficient regularity to be altogether depended upon, nor ſhould a veterinarian ever give a decided opinion from this alone, or he may ſubject himſelf to much mortification.

At ten years therefore, in a great number of inſtances, the two intermediate upper nippers will be found filled up: the tuſhes become very blunt, and loſe their internal concavity, and the fleſhy ridges of the roof of the mouth become leaner.

At twelve, where the diſappearance of the upper cavities is regular, thoſe in the corner are effaced, and the tuſhes are now only a rounded button; the fleſhy ridges are ſtill leſs evident, and the nippers now begin to puſh forward in a horizonal direction.

When a horſe lives to fifteen, his inciſive teeth become nearly triangular, and are ſtill more horizontal, the upper projecting over the lower, and the upper corner tooth frequently becoming ſawed as it were into two parts. They now are yellow, and frequently the grinders are irregular: the eyes likewiſe become ſunk, and the pits over them deep. As the animal advances in age, all theſe appearances ſtrengthen. The nippers flatten at the ſides, ſeparate from each other, become furred, and have furrows on their ſurface; grey hair appears over the eyes, the anus projects, while the cellular membrane ſurrounding it is abſorbed, the lips become thin and pendant, the lower being often nearly paralytic. But after the mark is out of the mouth, as it is termed, horſes yet appear vigorous in many inſtances, having much of their native ſpirit remaining. When a dealer is in poſſeſſion of ſuch a one, he becomes an object worthy his attention to give him a more youthful appearance. The principal part of this art conſiſts in the operation called *biſhopping*; which is the making an artificial cavity in the upper ſurface of the nippers, introducing ſomething within, and then burning it with a hot iron; but this can only deceive the inexperienced; there always remains a yellow mark around the burning; the upper teeth are ſeldom operated upon, therefore preſent their uſual appearance, nor can the tuſhes by any means be brought to their original ſtate.

The judgment gained by the teeth is liable to error, as ſome horſes living wholly on grain, and early worked, muſt neceſſarily wear theirs more than others, feeding principally on ſucculent matter; in crib betters, and thoſe who champ much on the bit, this variation may be very conſiderable, and make not leſs than two years' difference between them and others: nevertheleſs, as it is in the majority of inſtances certain and definite, ſo it is univerſally attended to, and certainly uſeful; yet a too ſtrict attention to it very frequently leads thoſe who are only moderate judges into very great error, by cauſing them to reject the moſt uſeful and valuable horſe without theſe marks, as being ſuppoſed paſt his work. Nothing is more fallacious than this; the common received marks of the age grant a criterion of not a third of the natural life of the animal, nor not of one half of the time in which he is perfectly uſeful, and fully capable of anſwering all the purpoſes for which he was intended: and it is only in a country like our own, where theſe generous animals are ſo early put to labour, and ſo unremittingly forced to purſue it, that this mark is ſo much attended to.

The beſt judges in every country pay but a ſubordinate attention to the appearance of the teeth, if a horſe appears what is termed freſh and ſound, that is, if all his organs are capable of their ſeveral functions, the limbs being firm, without external or internal derangement in the bones, tendons, or ligaments, exhibiting no appearance of too early, too great, or long continued exertion. The early ruin of Engliſh horſes is not only to be attributed to the excellence of the roads, by which perſons are induced to ride hard, nor is it accounted for by the prevalence of hunting, for only a certain number of horſes are engaged in this exerciſe; but it is principally to be laid to the account of their being too ſoon worked, before the maturity of the ſyſtem is complete, or the motive organs completely evolved. By this premature exertion taking place before parts are well capable of bearing it, early weakneſs is induced, and nature takes artificial means of ſtrengthening the debilitated organs; hence the cavities between the tendons, and their ſheaths are deſtroyed; parts take on a bony ſtructure, whoſe original formation was cartilaginous, as the lateral cartilages of the feet, and the articular proceſſes of the vertebræ, and a greater quantity of bone is depoſited on the ſurface of ſome bones than is natural, forming ſplents, ſpavins, ring-bones, &c.: and to counteract the unnatural waſte, other ſecretions are likewiſe preternaturally augmented, producing in the mucous capſules, windgalls; blood-ſpavins, &c. But where horſes are ſuffered to attain their full growth, and the complete evolution of their ſtamina, if they are afterwards put to full exerciſe, if it is not altogether inordinate, they are competent to the exertions expected of them, and reach old age ſound and vigorous. Many perſons will not purchaſe a horſe for hunting earlier than eight years old, and regard him only in his prime at ten or twelve. I was once fortunate enough to poſſeſs a horſe with very rare qualifications, which became mine at a period when many would have rejected him on account of his age, being then ten years old. He continued with me two years, excelling in the various capacities of a curricle horſe, in which he has trotted from London to Chelmsford in two hours and a half, the pace choſen by himſelf and partner, and driven by a lady. As a lady's pad, in which he was a moſt pleaſant and laſting canterer; as a never-failing roadſter, in which he has frequently trotted fourteen miles in an hour; and laſtly, as one of the moſt invaluable fox-hunters, no uſual leap being too high for him, no day too long, nor any pace too fleet for his active limbs. After poſſeſſing him two years, I ſold him for double the ſum I originally bought him for, to a gentleman who knew him well, and purchaſed him to act in the ſuperior capacity of a parade charger. I likewiſe remember to have ſeen a horſe belonging, I believe, to Lord Spencer, who was too hot to be truſted in the field with the hounds; from his breed and known good qualities, he had been patiently waited for many years, till time ſhould have made him more temperate; at the time I ſaw him, he was, if I miſtake not, twenty years old; he was now ſo much improved, that he had been rode for the laſt two years to cover, and it was hoped he might the next ſeaſon be truſted after the hounds, when the greateſt expectations were formed of him from his known ſpeed, vigour, and durability. At Cheſham, in Buckinghamſhire, there was a horſe of thirty-ſix years old, who exhibited no ſymptoms of debility, nor any external ſigns of age, but being nearly covered with warts. It was remarkable, but a fact, with regard to this four-footed Neſtor, that when any remarkable hard day's work was required, he was always choſen, as never failing in what was expected from him *.

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* Mr. Culley, in his *Obſervations on Live Stock*, mentions a horſe he knew, who lived to 47 years, having during that time a ball in his neck, received in the battle of Preſton, in the rebellion of 1715; and which was extracted at his death, which happened in 1758: and judging him at four years at the time he received the wound, and it is probable he was more, he muſt at his death have been 47.

Theſe, it is true, are unuſual inſtances, but it is not the natural œconomy of the animal makes them ſo; but his early application to full exertion, and the unremitting continuance of this, whereby his race is begun frequently before he is three, in the brake, lunge, or riding-houſe; before five his utmoſt ſpeed is exerted after the hounds in winter, and as a hackney againſt time in the ſummer; at ſeven, blind, foundered, and ſpavined, he gallantly ſhines in the mail or ſtage; at eight he faulters in the fiſh cart; and, before ten, worn out with diſeaſe and inanition, his reputed old age gains him an honourable exit at the ſlaughter-houſe.

Oxen and *ſheep* have their ages obſerved by their horns, which are more conveniently examined, and more certain in their appearances than their teeth. Oxen have a *permanent* and *temporaneous ſet of horns*. Sheep have only the permanent ſet.

In neat cattle, the age is ſufficiently indicated by the general appearance till the third year, when the temporaneous horns fall, and are replaced by a permanent pair. Theſe appear with a kind of button at the end; and as each ſucceeding year's growth protrudes this knobbed extremity from the head, a circle or ring round the horn is formed; conſequently, in theſe animals, if three years is reckoned for the button at the extremity, and an additional year for every circle, we ſhall have the age of the beaſt, though it is not unuſual to ſcrape, or raſp down theſe rings, to deceive the unwary. In thoſe kine who have no horns, the general appearances are conſidered, with the whiteneſs and equality of the teeth, which in the old are uneven, yellow, and ſometimes black. Neat cattle have inciſive teeth only in the poſterior jaw; there was no neceſſity for anterior nippers in them, for they gather long graſs principally, which they wrap into a tuft with their tongues, and applying it to the under or poſterior jaw, cut it off with the under teeth: they change their temporaneous ſet earlier than the horſe, beginning at two years to renew the front nippers, and getting a pair every year till they are five years old: thus, having eight nippers at this time, when they are called *full mouthed.*

Sheep have their age indicated by the horns and teeth. The horns in thoſe who have them, are more uſually examined; theſe are not changing, and each ſucceeding year preſenting a ring, have one year counted for the point, and an additional year for every one of theſe rings. Where they have no horns, the teeth are attended to. M. Buffon ſays, they have in their third year four broad teeth before, (they begin their ſecond dentition at twelve months,) in the fourth year ſix, and in their fifth year eight of the ſame kind: but this does not appear altogether correct; for, it is obſerved, that at twelve months, or one ſhearing, a lamb puts out his new front nippers, and every ſucceeding year, or ſhearing, he gains two more, till he is four years old, having then eight in his lower jaw, his upper like the ox, being deprived of them. The age of *goats* may be aſcertained in the ſame way; and, in *deer*, it is told by an additional branch appearing to the palm in the antlers or horns.

The Trunk.

The *trunk* of the horſe conſiſts of *ſpine*, *pelvis*, and *thorax*, or *cheſt*.

The ſpine is formed of ſeven cervical, eighteen dorſal, ſix lumbar, and five ſacral vertebræ, with the addition of an indefinite number of ſmall bones of the coccygis, or tail, uſually amounting to thirteen. The ſpinal bones are thus divided, on account of the varieties they preſent; but they have ſome characteriſtics in common. Each is compoſed of a ſpongy conſiderable ſubſtance, called its *body*, and parts protruded from this, called *proceſſes*. Theſe proceſſes unite to form a hollow through, which the ſpinal marrow is tranſmitted, and by ſome of theſe proceſſes the vertebræ are articulated with each other, as well as by their bodies anteriorly and poſteriorly; by which means their ſurface of attachment is much encreaſed, and the ſtrength of the ſpinal column is rendered very great. Though but little motion is allowed between any two vertebræ, yet the flexibility of the whole ſpine is very great; by which wiſe contrivance the ſpinal marrow, nerves, and blood-veſſels, are not liable to compreſſion.

The *cervical vertebræ* are by far the largeſt of the whole, and are thoſe ſituated within the neck, called by farriers and butchers the *rack bones.* They have but a very indiſtinct ſpinous proceſs, which is a very prominent feature in all the others, but in them amounts only to a ſlight riſing, with an anterior and poſterior extenſion of this ſpinous ridge. Ariſing by a common baſe on each ſide, is a very conſiderable prominence, which branches out into two tranſverſe proceſſes, and at the baſe of this prominence is a foramen for the paſſage of the vertebral arteries and veins; each vertebra likewiſe forms a groove poſteriorly, which, united to one in the oppoſed vertebra, produces a hole communicating with the great ſpinal canal paſſing through them, by which holes the cervical nerves paſs; they are very large here, from the greater freedom of motion theſe vertebræ enjoy more than the others. (*See deſcription of Skel.*) They are connected together by a round head in each, received into a correſponding cavity at the poſterior part of every one but the firſt, and this union has articular cartilages, and ſtrong capſular ligaments. They have likwiſe an anterior protuberance which is peculiar to theſe vertebræ, and is alſo wanting in the ſixth, which is blending its character into thoſe with which it is connected. It will be evident, that from the ſtrong means of articulation they have with each other, not only by the round head and correſponding cavity, but more particularly by their oblique proceſſes, that no diſlocation can take place between any of them but of the firſt and ſecond, which now and then happens from falls, &c.; in which caſe the animal dies, from the compreſſion of the ſpinal marrow, and is what is uſually called breaking the neck. The firſt cervical vertebra is termed *atlas*, becauſe in the human it ſupports the weight of the head, and is ſaid to be diſtinguiſhed from the reſt by having no body, but this in the horſe is a very defective diſtinction. (*Vid. a vertebræ, Skel.*) It branches out laterally into two tranſverſe portions, and anteriorly articulates with the occipital, receiving into two foſſæ the two condyles of that bone, between which is ſituated the ſpinal canal, which in this vertebra is very large; and on each ſide of this are two foramina, one pair of which tranſmits the vertebral veſſels, and the other a pair of nerves. Poſteriorly it articulates with the ſecond, by receiving its odontoid proceſs into its great cavity. This vertebra is the only one that has not the cervical ligament attached to it, which would have interfered with its freedom of motion. It is ſaid now and then to become diſeaſed in bad caſes of pole evil.

The ſecond cervical vertebra is named *dentata*, (*Vid. d, e, f, plate of Skel. vertebræ,*) from a conſiderable tooth-like proceſs inſtead of a head, which is received into the great cavity of the atlas; it has a conſiderable dorſal ridge inſtead of a ſpinous proceſs, *vid. f*: its anterior oblique proceſſes are blended together, and appear a mere extenſion of its body, and extend forward to allow freedom; its poſterior oblique proceſſes articulate with the upper oblique proceſſes of the third vertebra, (*vid. b*,) and the poſterior part of the body has a cavity for the reception of the head of that vertebra. Its tranſverſe protuberance has only its poſterior point, (*vid. d*,) ſo that this bone has only a ſingle tranſverſe proceſs on each ſide; the foramina are the ſame as in the former. Between this and the atlas is a ſpace where the ſpinal marrow is left unprotected, but by the cervical ligament (it is readily ſeen in the plate of *Skel.*); and is that part butchers ſometimes plunge a knife into what they call the pith of the neck, when they want to kill without effuſion of blood.

The 3d, 4th, 5th, and 6th cervical vertebræ have, inſtead of an odontoid proceſs, a round head articulating with the cavity of the one that goes before them. Their upper oblique proceſſes (*vid. h*) are diſtinct, and articulate with the lower of the one preceding them, and their lower (*vid. n*) with the upper of the one immediately behind. Their tranſverſe proceſſes are two on each ſide (*vid. i, k*); their dorſal ridge ſmall, and their bodies altogether leſs than the ſecond. At the baſe of their tranſverſe proceſſes they have a ſimilar foramen for the tranſmiſſion of the vertebral veſſels, and the hole through which the cervical nerves paſs out may be ſeen in the plate.

The *ſeventh cervical vertebra* is ſmaller than the others, and has no foramina for the tranſmiſſion of the vertebral veſſels, and but a ſmall ſingle tranſverſe proceſs on each ſide, but its ſpinous is larger than the others; its poſterior oblique proceſſes articulate with the firſt ribs, and it has a concave articular ſurface in its body for the head of the ſame rib. It will be found blending its character in with the dorſal vertebræ.

The *dorſal vertebræ* are eighteen, (*vid.* 18 *vertebræ*, *Plate* I.) and do not eſſentially differ from each other, but in the length of their ſpinous proceſſes, which in the firſt ſeven or eight is conſiderable, for the purpoſe of giving a long lever to the dorſal muſcles. It is theſe proceſſes that give height to the withers, and as they are covered with muſcles that are acting on them as levers, ſo it ought to be evident, that the withers themſelves cannot be too plentifully ſupplied with them, and hence that fleſhy withers are a great beauty; but it is the low loaden ſhoulder that is, or ought to be objected to among judges; and not a proper proportion of muſcle to a part ſo advantageouſly ſituated as the withers. Their oblique proceſſes are four to each, but are ſmall, as well as the two tranſverſe. They articulate with each other by their anterior and poſterior ſurfaces, and by their oblique proceſſes; and each articulates with two ribs on each ſide. As they advance in number they increaſe in ſize. They are pierced by the ſpinal canal, and tranſmit by their lateral holes the ſpinal nerves; but they have no foramina at the baſe of the tranſverſe proceſſes. Between each is interpoſed a ſubſtance of the mixed nature of cartilage and ligament, which is moſt compreſſible at its ſides, permitting the motion of the ſpine, and forming by the ſolidity of its centre a fulcrum or pivot for the bones to move on *.

When the ſpinous proceſſes after the ſixth or ſeventh are long, the horſe is called *roached backed*; which is not conſonant with our ideas of beauty, nor is it pleaſant to ride on ſuch a horſe, the ſpring being loſt or reverſed: but it is evident, it muſt be favourable to ſtrength, by giving an advantageous attachment to the dorſal muſcles. The ſpinous proceſſes of the withers become injured ſometimes from long continued fiſtulas, brought on from the preſſure of a pack, or other ſaddle: healing in theſe caſes can only be promoted by encouraging exfoliation.

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* This ſubſtance in the human is ſaid to be ſo compreſſible, that perſons are ſhorter in the evening than the morning; and hence recruiting officers wiſh to paſs their men in the morning, when this ſubſtance has gained its full extent after the reſt of the night: and from the compreſſion and waſting of this ſubſtance, it is thought, it is that old men who do not ſtoop, are yet much ſhorter than in their youth: this may be aided by the attrition of the articulatory cartilages. This nocturnal growth or increaſe was firſt diſcovered by an Engliſhman, and afterwards confirmed by Monſieur Moraud, a member of the Royal Academy of Sciences.

The *ſix lumbar vertebræ* differ but little from the dorſal; their bodies are rather larger, and their ſpinous proceſſes conſequently rather broader; but their tranſverſe proceſſes bare no compariſon to the others: for as there are now no ribs to protect the contents of the abdomen, nor to ſupport the dorſal muſcles, conſequently theſe are much lengthened out; and they have hence no articular ſurfaces but thoſe by which they unite with each other. The laſt of them joins with the ſacrum. (*Vid.* 1. 5, *vertebræ*, *Plate* I.)

It will appear evident from the foregoing deſcription, that theſe bones enjoy different powers of motion: the head is enabled to rotate and move extenſively upon the firſt, or atlas; conſiderable freedom in this reſpect exiſts between the firſt and ſecond. The remaining cervical vertebræ have likewiſe much motion from the form of their articulation, and the ſmallneſs of their ſpinous ridge. The dorſal can have little freedom on account of the ſtraightneſs of their union, and the ſituation of the ribs, while the lumbar have rather more, though from the length of their tranſverſe proceſſes it cannot be much. The ſpine in the horſe, and in brutes in general, is not liable to diſeaſed incurvation as in the human; for here there is no weight to ſuſtain, nor any perpendicular preſſure on any one articulating ſurface, nor on one ſide of the cartilago-ligamentous intervertebral ſubſtance more than the other, nor do their bodies ever take on ſpontaneous ulceration: but it is liable to malconformation, being ſometimes curved upwards, and ſometimes downwards more than natural; and it is more immediately liable to have bony matter thrown out over its cartilages; ſo much ſo as to anchyloſe nearly the whole dorſal and lumbar joints. It is this that in old horſes makes them ſo ſtiff and unwilling to lie down; or when down, to riſe up again: ſome horſes from this never lie at all.

The *pelvis* is compoſed of the *ſacrum*, two *oſſa innominata*, and *coccygis*. The ſacrum and coccygis are called the falſe vertebræ. The *ſacrum* was the part in animals anciently offered as a ſacrifice, and hence receives its name: it is uſually deſcribed as compoſed of five pieces, though it becomes as perfectly a ſingle bone, by age, as the occipital, which at the period the ſacrum is thus diſunited, is alſo compoſed of ſeveral diſtinct portions. It preſents five proceſſes anſwering to the ſpinous of the other vertebræ, and has likewiſe lateral protuberances which run into each other by age. It articulates with the laſt lumbar vertebræ by a kind of head; and likewiſe by two articulating ſurfaces uniting with the oblique proceſſes of this vertebræ, and forms alſo a groove to unite with a ſimilar groove in it for the tranſmiſſion of the laſt dorſal pair of nerves. It is itſelf pierced at its under part with two rows of foramina, for the paſſage of the ſacral nerves from the cauda equina, or continuation of the ſpinal marrow. It likewiſe has two articular ſurfaces by which it joins the ilium, and its poſterior extremity unites with the firſt bone of the coccygis, or tail. (*Vid. x, x.*)

The *coccygis*, or *bones of the tail*, vary in number from 8 to 16: in a moderate horſe uſually about 13; in the human there are only three. They are united together by articulating ſurfaces, and correſponding capſular and lateral ligaments: the firſt have the marks of ſpinous and tranſverſe proceſſes (*vid. Skel.*), and part of the cauda equina is continued to the fourth or fifth.

The two *oſſa innominata*, (*a*, *b*. *c*, *d*, *e*, *f*, *g*, *Skel.*) are uſually deſcribed as three pair of bones, though all traces of their diſtinct exiſtence are loſt long before the adult period: in animals intended to walk as ſoon as born, they are conſolidated even at birth, and are only ſeparate in a fœtus of three months. Theſe three portions, are the ilium, iſchium, and pubis. The *ilium* (*a*, *b*, *c*, *Skel.*) is the moſt conſiderable, and forms the haunches, or haunch bone, by a large unequal protuberance, (*vid. a*,) which, when very prominent, makes the horſe what is called *ragged hipped.* Uniting poſteriorly with the iſchium and pubis, it forms part of the cotloid cavity; the outer concave ſurface lodges the glutei muſcles, and the inner convex is covered by the iliac muſcles. From the tuberoſity it runs towards the ſacrum, and turns up into a ſort of ſpine very different from the human, articulating by its inner ſurface with the ſacrum (*vid. b*). The edge between forms the *chriſta.* Its poſterior angle unites with the ſacrum: its anterior is rough, and gives attachment to the abdominal muſcles, and the inferior unites it with the iſchium and pubis.

The *iſchium*, or *hip bone*, is a larger portion of the innominatum than the pubis, but leſs than the preceding (*vid. e, f*,). It has three angles, and an inner and outer ſurface: by the anterior of theſe angles it unites with the ilium and pubis, and forms part of the *cotoloid cavity:* by its poſterior it ſtretches back jointly with the ſuperior to form a curved proceſs, called its *tuberoſity*, (*vid. f*,) which is very different to the ſame part in the human. Its ſuperior angle is convex, and gives attachment to the ſacro-ſciatic ligament. Between the anterior and poſterior angle, it forms jointly with the pubis, the oval cavity, called *foramen thyroideum*, or *ovale*; (*vid. d*,) which is covered over by a very ſtrong ligament, ſerving as an origin to a muſcle, called obturator, from whence it is called *obturator ligament*; between this and a niche in the bone the crural nerves are allowed to paſs.

The *pubis*, or *ſhare bone*, (*vid. g, g*,) is the leaſt of the three, but aſſiſts in forming the *acetabulum*, or cotoloid cavity, for the reception of the head of the femur. By its anterior edge it unites with the ilium, and gives attachment to the rectus and obliquus muſcles; and by its anterior edge it unites with its fellow, forming the *ſymphyſis pubis*, while by the inferior it attaches the adductors of the thigh. The acetabulum is, we have ſhewn, formed by the aſſiſtance of each of the above portions, but in unequal degrees; the pubis adds leaſt, and the iſchium moſt. The depth of this cavity is greateſt ſuperiorly and anteriorly, where the danger of diſlocation is moſt; at the lower portion it is very ſuperficial, and has a kind of interruption, by which formation the thighs are enabled to croſs and paſs under the body: but that this interruption might not endanger the ſafety of the articulation, it is filled up by a ligament, and the whole brim is deepened by a cartilaginous cruſt round it; from which wiſe precautions the thigh bone is very ſeldom thrown out of this ſocket, though now and then it may happen (*See diſlocations*). The pelvis is ſtrongly attached to the ſacrum by the articulating ſurfaces we have deſcribed, and held in theſe attachments by ſtrong ligaments from the anterior and poſterior edge of the articular part of the ilium, uniting it to the riſings correſponding with the tranſverſe proceſſes of the ſacrum. The whole of the large poſterior opening between the innominata and ſacrum, is filled up by two ſtrong layers of ligament, which in the animal ſhould be called its *ſacro-iliac*, and its *ſacro ſciatic ligaments*. Theſe two layers permit the pyriformis muſcle, the ſciatic nerve, and poſterior crural veſſels to paſs out of the pelvis; and by being double, they are not preſſed on by the ſtrong action of the muſcles. From this, therefore, it may appear, that the pelvis forms a very complete cavity, though this is not evident on a bare inſpection of the bones; being filled up in all its cavities ſo by ligaments, muſcles, and integuments, as leave only an abdominal opening before, and an excretory behind. But the whole of its internal cavity is much larger in the brute than in the human ſpecies, which principally ariſes from the great curve in the human ſacrum, and which in the upright poſition we aſſume was neceſſary to prevent abortion; but which, as it gives an additional angle to the exit of the fœtus, ſo it greatly adds to the pain and difficulty of human parturition.

The *thorax*, or *cheſt*, compriſes the ſternum and ribs. The *ſternum* of the horſe differs very much from the human breaſt-bone, which is a perpendicular flat pile of bones: but in the horſe is inclined, and ſimilar to the keel of a veſſel, furniſhed at both ends with a cartilaginous portion; that of the poſterior being conſiderable, and from its figure called *xiphoid*, or *enſiformis*. It is in the colt compoſed of ſix pieces, which unite in the adult: the three anterior portions are ſharp, and covered with cartilage, the remainder are flatter. The two lateral ſurfaces receive the cartilaginous extremities of the true ribs. (*Vid. d, Skel.*)

The *ribs* are long perpendicular bones, with one end attached to the ſpine, and the other connected with the ſternum, either directly or indirectly. They are uſually 36, eighteen to each ſide: nine of which articulate with the ſternum, and are thence called *true ribs*; while the other nine uniting together by intervening cartilages, and which communicate with the firſt nine, are called *falſe ribs*. The central ones are the longeſt, gradually decreaſing in length both towards the neck and loins. The firſt is placed almoſt perpendicular, the ſecond leſs ſo, and their curvature, as well as their inclination, increaſes as they advance, ſo as to enlarge the dimenſions of the cheſt, which was at the firſt very confined, till, as they form the abdomen, the cavity is extenſive, and nearly circular (*ſee Plate of Skeleton*). As they proceed towards the pelvis, their inferior extremity is carried backwards, increaſing ſtill more the dimenſions, and ſtrengthening the parietes of the abdomen. Each of them has a body, an upper and lower extremity, and an upper and under ſurface. The upper extremity preſents a ſmall head (*vid. a*), and a ſmall tuberoſity: this head articulates by two ſurfaces to the bodies of two vertebræ, and the tubercle with the tranſverſe proceſs of the poſterior of theſe two vertebræ. The upper extremity is rounder than the body and inferior extremity. The anterior edge of each has a groove, in which run the intercoſtal veſſels and nerve, which it is very neceſſary to be aware of in operations on the cheſt. Above this likewiſe is a ridge to which the intercoſtal muſcles are attached, fixing themſelves into the oppoſite edge of the next rib. The groove is not continued to the lower extremity, for the veſſels and nerve having branched off, there was no

longer

longer any neceſſity for protecting them. To the lower extremity is a cartilage firmly attached, articulating with the ſternum, or each other: in the falſe, theſe cartilages are ſent off ſo as to form a conſiderable angle with the rib they ariſe from.

The ribs are fixed to the ſternum and ſpine by ſtrong ligaments: each lower extremity has attaching fibres fixed into the articular pits in the ſternum; and the upper extremity is connected by articular, as well as capſular ligaments. It is a very wiſe proviſion, that contrary to the general rule in bones, the heads and tubercles of the ribs are oſſified before birth, by which the animal is enabled to breathe as ſoon as born without detriment to them. It muſt be evident that the ribs in the horſe have but little motion, and that what they have muſt be forwards, particularly in the true; the firſt of which is completely a fixed point for the reſt to act upon, but the falſe can be elevated a little, by means of the flexibility of their inferior attachment, and which appears the reaſon they are thus attached: but even this would not be ſufficient without ſome other contrivance to enlarge the cheſt during inſpiration, which is effected by a very moveable diaphragm. The animal thorax could not have been formed as the human without detracting from the eaſe and ſtability of motion; hence to approximate the fore extremities, it was neceſſary to flatten the cheſt: yet a poſterior expanſion of this cavity is not only allowed, but required, and is as eſſentially neceſſary to the horſe as to the man. Every one knows the diſpoſition of a chicken-breaſted child to conſumption; and thoſe who are well acquainted with horſes know, that a narrow-cheſted one is equally liable to inflammation of the lungs, or broken wind: the greater convexity the ribs have, the more the cheſt has a cylindrical form, which is of all others the moſt extenſive; and hence capable of carrying on its functions to greater perfection, inhaling a greater quantity of air, and thereby being enabled to abſorb a larger quantity of its vital principle (*i. e. oxygen*); and as the belly always partakes of the form of the cheſt, and a flat-ſided horſe is always without much carcaſe, ſo there is but a very ſmall ſurface in ſuch a one for the abſorption of chyle, and the aliment is hurried through the inteſtines before its nutritious principles are taken up, as is found always to be the caſe with light carcaſed horſes, who are, as the grooms term them, waſhy, or ſcourers. It appears it was, by an obſervance of this, that Mr. Bakewell gained ſo much celebrity for his mode of breeding cattle, and upon which only his ſecret depended; nor can it be too much attended to in the breeding of all kinds of domeſtic animals: without this form a horſe may be fiery, but he never can be laſting; and without the ſame in other cattle, they may feed, but they never will fatten. It is needleſs to remark, that without this form, neither the one or the other can be beautiful.

The Anterior Extremities.

Theſe bear but little reſemblance to the human arm, particularly in thoſe quadrupeds, as the horſe, who have but one phalange: in thoſe with ſeveral, the reſemblance approximates much more, till in the fore extremities of the ape, it differs but little; but in the thumb, forming a bad antagoniſt to the fingers. It appears a very wiſe proviſion of nature, who has given a colt very long limbs at birth, that the form of parts might not be much altered in their future evolution; but, at the ſame time, the hinder ones are by much the longeſt; becauſe, were the fore equally ſo, the young animal would have been too much elevated from the ground, and rendered incapable of grazing, or even of ſucking conveniently. It is ſaid that the future height of the horſe may be known by doubling the extent of the elbow from the ground of the colt when foaled.

The *ſcapula*, or *ſhoulder blade*, is a broad, and rather triangular bone, applied to the cheſt, ſo that its apex reaches between the firſt and ſecond ribs, and the poſterior part of its baſe as far as the ſeventh. It is ſituated obliquely, with its largeſt portion above, its internal ſurface flat and ſmooth, and its external divided into two unequal portions by its ſpine. Its anterior edge (*vid. m, i*,) as it continues down, contracts inwards, and ends in a blunt rounded extremity, called its *coracoid proceſs*; but which in the horſe is not very beak-like. Its ſuperior ſurface or baſe, is furniſhed with a conſiderable cartilage, ſtrongly attached to it by ligamentous fibres, by which the ſurface of attachment of the muſcles of this part is much increaſed; yet the weight and thickneſs of the bone but little augmented. The poſterior edge inclines inwards, and ends in the cervix, or neck of the ſcapula, and which neck terminates in a ſuperficial cavity, receiving the head of the humerus or arm, and called the *glenoid cavity* (*vid. e*). The *ſpine* (*vid. h*,) is a riſing, beginning from a ſlight forked diviſion in the baſe, and increaſing in thickneſs, is continued down, dividing the external ſurface into two portions, till towards the lower part, where it forms a rounded extremity, which in the human is ſtretched out, to form a ſharp proceſs, called proceſſus acromion; but which, as there was no clavicle to articulate with in the horſe, ſo this formation would have been uſeleſs. This ſpine is rough for the attachment of the trapezius muſcle, and below its rounded extremity is a hole for the tranſmiſſion of the medullary veſſels. The two portions it forms, are called the *antea* and *poſtea ſpinatus foſſæ*. The antea ſpinatus foſſa, *vid. f*, is the leaſt and moſt ſuperior; the poſtea ſpinatus foſſa is the larger and moſt inferior (*vid. g*).

The ſcapula is attached to the cheſt by very ſtrong muſcles, but has no bony, nor any ligamentous union, unleſs the ſtrong aponeurotic expanſion from its cartilaginous baſe can be ſo conſidered: it is particularly held in its ſituation by the ſerratus major, which is ſo ſpread as to attach the ſcapula, and ſuſtain the cheſt by its very ſtrong tendinous fibres. At its lower part it is fixed by the pectoral muſcles; and we accordingly find, that when from a ſlip the legs have been forced too wide aſunder, forming what is termed a ſhoulder wrench, theſe muſcles are tumified and tender. By this muſcular attachment, this bone has much motion round its own centre, having no clavicle to confine it. Its uſual ſituation is, to a plane perpendicular to the horizon, in an angle of 30 degrees, and has a motion in its greateſt extent of 20 degrees; hence as it does not paſs beyond the perpendicular backwards, ſo the more oblique its ſituation, the more degrees in the circle it can occupy; and thus can aſſiſt the action of the humerus in this degree. Likewiſe inaſmuch as the ſcapula is inclined, the greater power is given to the muſcles acting on the arms, and which of courſe are greatly influencing the progreſſion. The ſcapula ſhould not only be inclined, but it ſhould likewiſe be broad, to give greater attachment to its muſcles: from all which it becomes evident, that the uſe of this bone is to ſerve as a moveable point to the arm, that being able to alter its poſition on different occaſions, greatly enlarges the motion of the whole extremity, and renders it more extenſive than that of the hinder, which was neceſſary, as the animal uſes theſe feet in ſome reſpects as hands; and likewiſe as they are often thrown much out of the perpendicular, as in trotting in a circle, paſſaging, and the like. Hence it becomes evident that a glenoid cavity is the beſt poſſible for this bone, and fully able to protect this articulation; and that a diſlocation between the ſcapula and humerus, as being ſo moveable, is even leſs frequent than between the acetabulum and femur, when the innominatum is not able to follow the motion of the thigh. The glenoid cavity though ſuperficial, is yet ſomething deepened by a cartilage that ſurrounds its edge for this purpoſe.

The *humerus*, or bone of the real *arm*, is a ſtrong and rather ſhort bone, very unlike the ſame bone in man; and is extending from what is termed the point of the ſhoulder, which is the anterior extremity of this bone, to the elbow, (*Vide, n, o, p, q, Skel.*) forming an angle with the ſcapula extending obliquely backwards, as the ſhoulder does obliquely forwards. At the poſterior part of the extremity, the bone ſtretches out into a round head ſupported on a cervix, (*Vide n,*) with a circular foſſa ſurrounding its baſe, for the inſertion of the capſular ligament; this head is received into the glenoid cavity of the ſcapula. The anterior part of this upper-extremity is what is improperly termed the point of the ſhoulder, (*Vide o,*) and has three prominences into which the extenſor muſcles of the arm are inſerted, and between the two moſt anterior of which the firm flattened tendon of the flexor radialis anticus paſſes, tied down by a ligament a ligament acroſs*. This tendon is almoſt of a cartiginous hardneſs, and is flattened out into a ſpecies of patella to this articulation; anſwering all the purpoſes of the patella of the knee, and effectually preventing any diſlocation of this joint forwards, which is the only point in which it would otherwiſe be at all probable. The body of this bone has an external and internal tuberoſity, for the inſertion of adductor and abductor muſcles; and as it proceeds becomes broader, and at its ſuperior extremity terminates in its inner and outer condyles, *(Vide q,)* which are divided by riſings and depreſſions, articulating with ſimilar depreſſions and riſings in the ſuperior extremity of the radius; thereby confining the motions of this joint to flexion and extenſion. In the front of this extremity is a cavity to receive the protuberances of the radius, in the greateſt flexions of the fore arm; and behind there is a very deep depreſſion for the reception of the olecranon or elbow, when it is extended again. The humerus is attached to the ſcapula by a capſular ligament, which extends from this bone to the cervix of the omoplate or ſhoulder blade; over this are extended, both externally and internally, ſtrong ligamentous layers from one bone to the other; and when added to this, are conſidered, the peculiar tendon I have deſcribed, and the tendinous expanſions of the other muſcles, it will be ſeen this articulation is very ſtrong.

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* It by no means appears improbable, that what has been termed a ſhoulder ſlip is a rupture of this tranſverſe ligament, and a removal of the tendon; in fact a true diſlocation of the tendon of the flexor radialis anticus, which I have deſcribed as performing the office of a patella, thus forced from between the protuberances it ſlides on. In this caſe, the common practice of ſwimming would not be a bad one; but when it is a ſimple extenſion of the ligaments, it is adding fuel to fire.

The *fore arm* is compoſed of the *radius* and *ulna*, among horſemen, called the *arm* and *elbow*, (*Vide ſ, r,*) which are ſo intimately united in the old horſe as to be by ſome, and without any great impropriety, deſcribed as one bone*. The *radius* is a long cylindrical bone, with a body and two nearly equal extremities. The ſuperior is flat, and receives into articular depreſſions the condyles of the humerus; it has anteriorly tuberoſities for the attachment of muſcles, and poſteriorly an articulating ſurface for the ulna. Its body is ſlightly convex anteriorly, and its inferior extremity furniſhed with four eminences; covered, as is common with articular ſurfaces, with cartilage, and articulating with the firſt bones of the carpus or knee. The anterior part of this extremity is depreſſed with three ſinuoſities, receiving the tendons of the extenſor muſcles of the foot. It is obſerved in all animals intended for ſpeed, that the length of this bone is very conſiderable. In the hare and greyhound, the knee is but a very ſmall diſtance from the ground; and a long canon is found equally favourable to quick motion in the horſe, and by good judges is always preferred: the parts below the knee appear to be flexed in progreſſion, to receive the weight of the machine, but not to add to the extent of its progreſs; and hence as this is effected by the parts above, the longer they are the better. It muſt likewiſe appear, that the ſhortneſs of the parts below muſt be favourable to ſtrength likewiſe, though it detracts ſomething from the eaſe and rebound of the ſpring; and hence amateurs in the manege, always chuſe a ſhort arm as better adapted to the cadences taught by that art. The *ulna* is articulated at the poſterior and ſuperior part of the radius with intervening cartilages, and ſtrong ligamentous fibres; it then paſſes downwards *(ſee ſkeleton)* unattached, permitting veſſels to paſs between, till it has reached the middle of the radius, when it terminates in a point, which is likewiſe attached by ligamentous fibres. As the horſe advances towards age, the intermediate cartilages become abſorbed, and bony fibres thrown out, forming an inſeparable union between them, and uniting them in fact into one bone, from which they become ſo deſcribed by ſome authors. Superior to where the ulna unites with the upper part of the radius, it ſtretches out into a proceſs covered with cartilage, and received into the great poſterior foſſa of the humerus; from which the whole extends backwards to form the olecranon, whoſe whole ſurface is rough for the inſertion of the ſtrong extenſor muſcles of the fore arm. On the ſlighteſt inſpection of the ſkeleton, it will appear how much the motions of the fore extremity depend on the length and obliquity of this proceſs, which acting on the principle of a lever in the extenſion of the arm, muſt neceſſarily, as it is long or ſhort, make all the difference between a long and a ſhort purchaſe, and of courſe is removing the motive force farther from the centre of motion; its approaching the horizontal direction or backwards muſt in this reſpect be greatly favourable. This bone likewiſe ſerves to keep up an equilibrium between the flexor and extenſor muſcles*. The ulna and radius are articulated with the humerus, by a very extenſive capſular ligament ſtretching from the anterior part of the humerus, circumſcribing its condyles and the whole of the poſterior cavity, and inſerted into the radius and ulna; taking in the whole articular ſurface, which is plentifully ſupplied with ſynovia. It is ſtrenthened in its articulation by an external and internal ligament, extended from the condyles of the humerus over the head of the radius, and likewiſe by the tendinous and aponeurotic expanſions ſpread over the whole, by which this joint is wholly prevented from diſlocation; but the olecranon has been found at times fractured, and I have underſtood that a horſe belonging to the Veterinary College travelled many miles after it had happened. From the great ſtrength of the muſcles implanted into it, a proper and complete reduction of the fractured extremities would be hopeleſs. Punctured wounds have ſometimes taken place in this part, when from the conſtant motion, a large quantity of air has been abſorbed, forming extenſive emphyſema. It is ſaid, the olecranon is ſometimes rendered carious from wounds on the elbow, as when a horſe lies with his fore legs doubled under him, and his calkins preſs upon this part; but this is a very unuſual accident.

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* Bourgelat deſcribes the radius and ulna as one bone, under the name of cubitus. La Foſſe ſpeaks of them as two bones, radius and cubitus. Cubitus in authors is ſometimes applied to either bone, becauſe in the human theſe bones are nearly of a length, and not far diſtant from the meaſure of a cubit; but as this will not apply to either of theſe bones in the horſe, the term ought to be rejected entirely.

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* On a conſideration of the different uſes of the limbs, it muſt appear, that the formation of the elbow joint in the horſe and man, vary eſſentially from each other; being in the human much more complex; the ulna becoming in him the longeſt, and receiving above a tubercle of the radius, whilſt below the radius gives the cavity, and the ulna furniſhes the tubercle; by which means the human hand enjoys the motions of pronation and ſupination, the radius moving on its own axis at the upper end, and revolving round the ulna at the lower. In the animal, as progeſſion is the principal intent of theſe extremities, and as the ſcapula forms a ſufficiently moveable articulation for all the other purpoſes the horſe puts his fore legs to; ſo the motion of the elbow in him is confined to ſimple flexion and extenſion; by which means the joint can be much encreaſed in ſtrength; which is neceſſary, in as much

The *carpus* or *knee* is compoſed of ſeven bones, which are very irregular in their figure, with nume-

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much as progreſſion requires that the arms ſhould be nearly as ſtrong as the legs, which is by no means the caſe in the human.

rous articulating ſurfaces covered with cartilage; internally they are ſpongy, and externally uneven, for the attachment of numerous ligaments. They are placed in two rows, the uppermoſt of which contains three bones articulating with the inferior extremity of the radius; and a fourth without the row, attached to the poſterior of the radius and of this firſt row. The ſecond row is likewiſe compoſed of three bones and articulates with the large and ſmall metacarpals. The *ſcaphoid* is the firſt bone of the upper row on the inner ſide *(Vide* 2, 2*)* and articulates with the internal condyle of the radius anteriorly, and laterally with the lunare; ſo that the ſcaphoid and lunare are placed over the magnum in front of the knee; as in building, two bricks are placed ſo that their line of diviſion is over the centre of a third, by which means great ſtrength is given to this articulation; it likewiſe articulates inferiorly with the trapezoid. The *lunare* is the ſecond bone of this row *(Vide* 3, 3*)*, articulating above with the middle and anterior part of the radius, below with the magnum and cuneiform, and laterally with the ſcaphoid and unciform, and by a ſmall poſterior point to the piſiform. The *unciform* is the outer bone of the firſt row, *(Vide* 4*)* and articulates above with the external condyle of the radius; poſteriorly with the piſiform; below with the cuneiform, and laterally with the lunare. The *piſiform*, *(Vide* 1, 1*)* projects poſteriorly on the outer ſide of the ſuperior row, ſo as to give a greater power of attachment to muſcles, and to raiſe the ligaments of the knee from compreſſing the tendons. The flexor carpi externus, inſerted into it, it is evident by this projection, from the centre of motion, muſt gain a very advantageous poſition. It articulates with the outer and poſterior part of radius by one ſurface, and by another to the unciform. The *trapezoid (Vide 7)* is the firſt bone on the inner ſide of ſecond row, and is ſituated at the poſterior lateral internal part of the knee, articulating above with the ſcaphoid, below with internal ſmall metacarpal, and a ſmall part of canon, (in the plate it appears rather too ſmall,) and laterally with magnum. The *magnum* is the middle bone of the ſecond row, *(Vide 5, 5)* and is the largeſt of the whole, receiving above the ſcaphoid and lunare, and reſting below on nearly the whole of the ſurface of the large metacarpal or canon; articulating at the lateral internal with the trapezoid, and at the lateral external with the next bone. The third and moſt external of the ſecond row is the *cuneiform* (*Vide* 6); it reſts upon the external ſmall metacarpal, and in part upon the great metacarpal; and articulates above with the unciform, and laterally with the magnum*. The carpal bones are covered with cartilage on their articular ſurfaces, and their non-articular are rough for ligamentary attachment; the whole are very cloſely connected together by theſe ligaments, allowing but little motion between any but the firſt and ſecond row; yet ſome little is allowed between the whole, by which the jar is taken off when the limb approximates the ground; and the articulation gains at once great ſtrength with extenſive motion, two very eminent and uſually very diſſonant ends, without ſome peculiar and complex apparatus. The capſular is a very extenſive carpal ligament, ariſing from the inferior extremity of the radius and paſſing to the firſt row of bones, to which it is attached; it then paſſes more looſely to the ſecond; from thence it is continued on inveſting the ſuperior extremities of the large and ſmall metacarpals; within this is ſecreted a large quantity of ſynovia or joint oil; and it is the eſcape of this, and the penetration of the cavity of the joint, that makes deep wounds of the knee ſo dangerous. Beſides the capſular, there are very ſtrong oblique plans of fibres paſſing from the outer and inner ſides of the radius, firmly attached to the knee bones, and inſerting themſelves into the ſmall metacarpals poſteriorly. There are ſeveral layers of ligamentous

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* Hardly any two authors agree in the names of theſe bones; the French differ moſt eſſentially from each other. Bourgelat ſimply ſays there are nine bones, which is two more than exiſt, but he does not attempt to name them. Mr. Stubbs, I believe, deſcribes

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deſcribes as the cuneiform, that which I call unciform. I am not aware how Mr. Coleman terms them, but I believe in the ſame manner with myſelf. The human wriſt is formed of eight bones, the trapezium being added to the above.—*Bourgelat.*

fibres,

fibres, ſome of which are applied to the bones; others are more looſe, and ſtretching over the tendons form annular bands; of this nature is that conſiderable one extended from the piſiform, and inveſting within its cavity the flexor tendons of paſtern and foot. Each bone likewiſe has individual fibres connecting it to the bones with which it is attached, forming on the whole a moſt complex ligamentary plan, greatly ſtrenthening the knee joint, and preventing a poſſibility of diſlocation. Theſe bones are liable to have éxoſtoſis, or a throwing out of bony matter, uniting them together; ſometimes from violent inflammation the joint becomes achyloſed by this means.

The *metacarpus*, *(Vide t, t)* or what is termed the *canon* or *ſhank*, is formed of a large metacarpalbone and two ſmall ones which the French term ſtyloids or perones. The *canon* is a plain cylindrical bone with its two extremities rather enlarged; the ſuperior articulating with the ſecond row of the knee has little correſpondent riſings and depreſſions for thoſe bones. Anteriorly its head forms a tuberoſity encircling the the bone, poſteriorly this is inducted into two ſurfaces receiving the ſmall metacarpals. Its inferior ſurface is formed into two condyles, divided by an eminence, and articulating with the paſtern and ſeſſamoids. The ſmall *metacarpals (Vide u, u)* are one on each ſide, each having a ſuperior articulating ſurface uniting it with the carpal bones; each has likewiſe a ſurface of attachment with the canon at its ſuperior part, having a cartilaginous lining for this purpoſe, and being tied in their ſituation by ligamentous fibres, they then paſs tapering down leſs cloſely united near two thirds of the length of the bone, when they terminate by an unattached point or little button.

The ſmall metacarpals are attached by a large aponeurotic expanſion, which will be deſcribed with the extremities; but they are immediately connected with the large metacarpal bone by ſtrong appropriate ligamentous fibres; yet not ſo cloſely but that they have ſome motion, and hence can deſcend when preſſed upon by the bones of the knee; and which appears one of their principal uſes. The internal receives the weight of the trapezoid, the external receives part of the preſſure of the cuneiform, and hence the ſpring in action can be wonderfully encreaſed. But as the animal grows old, and his exertions are greater than his ſtrength, ſo nature ſympathiſing with the general weakneſs, unites theſe bones by throwing out bony matter between them; by which means, though their union becomes conſolidated, their ſpring is loſt; for in old horſes theſe bones are almoſt always united to the canon. Nature likewiſe goes a ſtep further, being obliged to it by our over exerting this generous animal when young and tender, and when the depoſit is greater than the abſorption; in which, from the encreaſed preſſure on theſe bones, inflammation is ariſing, and bony matter is thrown out on one ſide, uniting one or both of them with the canon, and thereby preventing that diſlocation nature appeared to apprehend. In young horſes, from the depoſit being greater than the abſorption, ſo there is a very conſiderable quantity of oſſeous matter thrown out, and this forms what we term ſplent. If this takes place on the inner ſide of either of the metacarpals, it is evident it muſt interfere with the motion of the tendons, and hence inevitably produce lameneſs; if, on the outer ſide, it does not often occaſion much pain, or any lameneſs. It is uſual to raiſe the outer heel of the ſhoe, by which means the weight muſt be thrown on the inner ſmall metacarpal; and this has been thought to be the reaſon why ſplent is uſually on the inner ſide; but perhaps this will not wholly account for this partiality to one ſide more than the other; the weight of the carpal bone preſſing on the outer ſmall metacarpal, is divided between it and the canon; but the internal receives nearly the whole weight of the trapezoid; add to which, that from a natural debility in young horſes, the legs are diſpoſed to tend inwards, which may further aſſiſt this. Another very principal uſe of theſe bones is, the forming a groove for the paſſage of the tendons, protecting them in this paſſage, and confining them to a proper ſphere of action, by having a particular expanſion ſtretched from one to the other. This groove likewiſe gives origin to the ſuſpenſory bifurcating ligament of the paſtern.

The *paſtern.* The reſt of the extremity from below the canon conſiſts of one phalange*, compoſed of four bones, with two additional ſmall ſeſſamoids at the fetlock joint. The *ſeſſamoids (Vide w, w)* are two ſmall bones exactly oppoſed to, and articulated with, the poſterior ſurface of the ſuperior part of the paſtern bone, and the inferior part of the canon. They are ſituated ſide by ſide, and each has a cartilaginous concave articulating ſurface with the reſt, rather rounded, and are firmly attached in their ſituation by ligaments, the principal of which is the ſuſpenſory. They appear to act both as a ſpring, and to throw the tendon of the foot which ſlides over them, farther from the centre of motion. They act as a ſpring by receiving ſome of the weight of the canon when the paſtern has its proper obliquity, but when it has not the paſtern bone receives the whole, which occaſions inflammation, and ſuch horſes are ſoon ruined. The *paſtern* or *firſt phalanx, (Vide v, v)* is ſituated obliquely forward, and upon which obliquity depends the eaſe and elaſticity of the motion of the animal; nevertheleſs, when too long, it requires too great an effort in the tendinous and ligamentous parts to preſerve it in its ſituation, and thence long jointed horſes become ſtrained, as it is termed. The ſuperior ſurface of the bone receives the greater part of the inferior ſurface of the canon; its poſterior upper part articulates with the ſeſſamoids, and its inferior with the coronet or ſmall paſtern. 'It has in front a riſing portion, which is continued through the upper part, and divides it into two articulary depreſſions; the body is much ſmaller than either end, particularly than the upper. The inferior extremity ends in two rounded articulating protuberances.' It has a capſular ligament at each extremity, with lateral fibres ſtrengthening the articulation; the ſuſpenſory is likewiſe continued on it, by all which means it becomes firmly articulated.

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* The more one views the ſeries of animated exiſtence, the more we are led to admire that wonderful harmony throughout, which allows of no breaks or disjointure. Man has numerous phalanges. The monkey tribe with cats, dogs, and many others, have likewiſe as many; but they degenerate; the thumb of the monkey is but an imperfect antagoniſt to his fingers, while the fifth or dew claw of dogs and cats is ſtill leſs uſeful. From theſe we deſcend to the cloven footed tribes, who have only two perfect phalanges, and two imperfect. In the ſoliped there is but one phalanx; but that the connection might not be loſt, there is, as we have ſhewn, two imperfect metacarpals.

The *leſſer paſtern* or *coronet bone* receives the great paſtern, and is peculiar in having its largeſt extremity below; it preſents an inferior, an anterior and poſterior ſurface; but cannot be ſaid to be ſquare *(Vide x, x)*. Its anterior eminence is received into the anterior inferior depreſſion of the paſtern; and poſteriorly the upper ſurface is formed into two depreſſions, receiving the pulley-like ſurface of the paſtern. Inferiorly it terminates in two ſimilar pulley-like ſurfaces, and an anterior depreſſion correſponding with the anterior eminence of the coffin bone. It likewiſe articulates with the navicular bone, which has two depreſſions receiving its prominences when this joint is fully extended. This bone at its upper extremity receives the capſular ligament of the paſtern; beſides which, it has ſtrong ligamentous fibres on each ſide; inferiorly, beſides its capſular, it receives the ligaments of the navicular bone, as well as its appropriate ligamentary junction with the coffin.

The *coffin bone* is a very peculiar one, and forms the third phalanx *(Vide y)*. It correſponds in ſhape to the hoof of the horſe, which with its appendages, it fills. It is very porous, with its bony fibres perpendicularly placed ſo as to give it a rough linear appearance, particularly at the lower part. When viewed in front an eminence is ſeen at the upper part to which the tendon is attached: the lateral parts are not ſo high but project farther back, and form two lateral proceſſes, but which are not always diſtinct. In the lower of theſe proceſſes or between, is uſually a conſiderable branch of an artery paſſing from the poſterior part, and which reaches round two thirds of the ſemidiameter of the bone, and then is given within it and to the laminæ; there is likewiſe uſually a lower lateral groove from which a branch of this upper trunk paſſes to the under ſurface of the bone. Above theſe proceſſes is a concavity which receives the lateral cartilages of the foot, and gives attachment to the capſular ligament. Round this outer ſurface of the bone is attached the ſenſible laminæ. The inferior ſurface has two concavities;

cavities; the anterior has no foraminæ, and to it the ſenſible ſole is attached: the poſterior appears hollowed out of this, and preſents a riſing line ſhewing the extent of attachment of the flexor tendon; on this ſurface two grooves that lodge two conſiderable arteries appear; and to this concavity under the flexor tendon, ligaments are attached. The upper ſurface of this bone has two articular depreſſions divided by a riſing line continued from the anterior eminence, and which are covered with articular cartilages. *See Plate* IX. *where this bone is repreſented.*

The *navicular*, *nut*, or *ſhuttle bone*, is ſituated at the poſterior part of the coffin, ſo that its upper ſurface forms a continuation of the articulating ſurface of that bone; receiving jointly the broad extremity of the little paſtern; having two depreſſions and a riſing correſponding with ſimilar ones in the coffin. It is as it were laid upon the flexor tendon which paſſes up over its poſterior edge (*Vide Plate* IX). Theſe parts will be more particularly conſidered when deſcribing the feet.

The poſterior Extremities.

Theſe differ much from the anterior not only in the ſtrength of the parts, but in the length and direction of the bones forming them. The late profeſſor of the Veterinary College, Monſieur St. Bel, has erroneouſly deſcribed the amount of the various angles, and the revolution of the circular portions the joints deſcribe, as the ſame in the fore, as in the hinder limbs; but it has been proved that his admeaſurement of the extremities was inaccurate; and that had the formation he laid down exiſted, no regularity of motion could have taken place.

The *femur* or *thigh bone* is the largeſt in the body. From its upper extremity goes out in an olique direction the cervix, (*Vide k*,) to which the rounded head is attached, which articulates with the acetabulum of the pelvis. Within this head is a cavity giving origin to a flat ligament, though improperly termed round, which is implanted in the acetabulum, thus retaining the head of the thigh very ſtrongly in its ſituation: below the head is a ridge for the inſertion of the capſular ligament, and from the inner part of the cervix is a ridge extending down, in the middle of which is is a riſing (*Vide l*) called the *internal trochanter* ſimilar to that in the human femur. On a line with the caput or head, is a large depreſſion receiving the tendons inſerted into it; from this, the bone is ſtretched up into a very tall epiphyſis, (*Vide i*,) called its *great trochanter*; which is curved forward and ſerves for the attachment of the gluteus maximus, to which its ſituation muſt give great force; below this there is a very conſiderable tuberoſity that may be called the tuberoſity of the great trochanter. Behind this trochanter there is a conſiderable cavity into which the muſcles are inſerted: below which again, there is on the outer ſide another proceſs called the *lateral external trochanter*, (*Vide l*,) which in the human is wanting. The body has two flattened ſurfaces, one poſteriorly, and another to the lateral and external part: uſually about the middle is a foramen for the tranſmiſſion of the medullary veſſels. Its inferior extremity terminates in four condyles. The anterior unite to form a ſurface on which the patella ſlides (*Vide m, m*): the poſterior, (*Vide n, n*) have a cavity behind them in which ſome of the muſcles of the leg ariſe, and in which the crural veſſels paſs protected, ſurrounded by fatty ſubſtance. The femur is not, as in the human, curved forward, but is ſtraight in its body, though oblique in its direction, being carried forward, ſo that the patella falls within the line of the haunch. The upper extremity articulating with the pelvis is called the *whirl* or *round bone* by farriers; and is held in this ſituation by the ligament we have deſcribed, and by a ſtrong capſular, as well as by the large muſcles ſurrounding the joint; nevertheleſs, it is now and then diſlocated, though a violence of ſuch magnitude, more uſually fractures the head from the neck of the bone.

The *patella* is called by farriers the *ſtifle*; it is nearly angular and not much unlike the human, and has an anterior rough concave ſurface to which ligaments are attached, and an interior which is cartilaginous adapted to the convexity of the femur and tibia. The patella has ſome of the tendons of the ſtrongeſt muſcles of the thigh inſerted into it; and from thence continued over to the tibia; it muſt thus greatly aſſiſt in the motion of the leg and give theſe muſcles wonderful power. It is attached in its ſituation by the ſtrong muſcles implanted into it above, and a ligament from its lower part, united with an expanſion of the rectus tendon ſtretched over into the depreſſion at the head of the tibia. This bone may be fractured from blows or kicks; though ſuch an accident is very unfrequent in the horſe; but when it does happen, from the great ſtrength of the muſcles the upper part is drawn up the thigh and can by no means be brought down again: in the human there is an apparatus to keep the divided ends together; but in the horſe nothing of this kind could be applied ſo as to be retained.

The *tibia* is a large bone ſituated within that part called the thigh, though ſpeaking with analogy to the human, it is properly the leg (*Vide q*, *q*). It is formed of a large epiphyſis called its head, and a ſmall attached pyramidal part called the fibula, (*Vide r*, *r*) with another epiphyſis forming its lower extremity, furniſhed with articulating protuberances termed malleoli. This bone is placed obliquely backward; as the femur is obliquely forward; forming with that bone an obtuſe angle. The ſuperior extremity has an anterior flat protuberant ſurface receiving the patella in the flexions of the limb, and having ligaments inſerted into it; it has likewiſe an upper ſurface with two ſlight articular foſſa ſeparated by a riſing edge, which enters between the condyles of the femur. On this likewiſe the ſemilunar cartilages are placed, (*Vide p, p,*) and in a hollow formed for this purpoſe are lodged the cervical ligaments of this joint; and behind run the popliteal veſſels in an appropriate cavity ſurrounded by fat. The body is nearly triangular, the anterior angle of which is called its ſpine, and forms the human ſhin; and on this body is ſeen a foramen for the tranſmiſſion of the medullary veſſels. The inferior extremity is formed into three conſiderable protuberances, and a leſſer one, correſponding with the pulley-like ſurface of the aſtragulus; the riſings of the one being received into the depreſſions of the other, ſo as to form the ſtrongeſt poſſible articulation.

The *fibula* in the horſe appears nothing more than an epiphyſis to the former bone uniting with it by age; and appears more deſigned to keep up that beautiful connection we obſerve throughout animated nature, than for any great uſe in the machine. It is attached by a cartilaginous ſurface to the lateral ſuperior and poſterior part of the tibia, with its baſe upwards, and its point directed below (*Vide r, r*) reaching a quarter of the length of the tibia, to which its lower point is attached.

The articulation of the tibia with the femur is by a glenoid cavity, conſequently this joint requires ſtrong ligaments, or that diſlocation might take place, which on a ſuperficial obſervation one might deem probable, but ſo perfect is the mechaniſm of this joint, that I never heard of an inſtance of it. The *ſemilunar cartilages* of this joint by being thick on the outſide and thin in the middle, give ſome depth to this, otherwiſe ſuperficial joint; but the principal ſtrength of this articulation is derived from its ligaments, which are a capſular, lateral, and crucial. The capſular is extenſive and completely inveſts both extremities of the bones forming the joint. The crucial ligaments ariſe within a depreſſion in the articular ſurface of the tibia, and croſſing each other are inſerted into the poſterior part of the condyles of the femur. The lateral ligaments are an external and internal, ariſing from the condyles of the femur, and inſerted into the head of the tibia.

The *tarſus* or *hock* is in the horſe an aſſemblage of ſix bones, (*Vide Skel.*) forming a moſt complex and important joint, with the parts compoſing it ſo intimately united as to appear but one bone, allowing but little motion between them; yet that little is uſeful in preventing jar and concuſſion: and by having ſuch numerous points of contact it is rendered ſtronger. The human tarſus is compoſed of ſeven bones, having one called navicular in addition; as in man this part was to be oppoſed to the ground, ſo it is arched inferiorly to give it greater firmneſs and more ſpring; that which forms the point of the human heel conſtitutes the point of the hock in the horſe.

The *aſtragulus* is the largeſt of theſe bones and of a moſt irregular figure (*Vide* 3, 4. 3, 4). Its upper and anterior ſurface is pulley-like, having two remarkable circular riſings with an intermediate depreſſion, which articulate with the malleoli of the tibia. Poſteriorly it has ſeveral ſurfaces of attachment with the calcis, receiving the eminences of that bone into conſiderable depreſſions; inferiorly it has ſimilar ſurfaces for articulation with the great cuneiform, upon which it reſts; and poſteriorly at the lateral external part it has a ſurface of attachment with the cuboid. The *calcaneum* (*Vide* 1,2. 1,2,) is placed poſteriorly from the centre of the joint, and is called the hock by diſtinction, as upon this part the action of the joint principally depends; its ſuperior part in the young ſubject is an epiphyſis. The tendo achilles, or twiſted tendons of the gaſtrocnemii muſcles are attached to this; the longer therefore this proceſs is formed, the longer lever theſe muſcles have to act by; and a very ſlight increaſe or diminution in the length of this, muſt make a very great difference in the power by which the motions of this joint are operated. It is by this tendon that when the animal has inclined the angle between the canon and the tibia, or in other words, when his hinder extremities are bent under him in a gallop, or one of them in the trot, that he is enabled by the action of this part again to open it; the greater therefore the natural ſtrength or advantageous poſition of this lever, the leſs muſcular exertion will be neceſſary; bywhich his actions can be oftener repeated in a given time, accelerating thereby the ſpeed; and can likewiſe be longer continued, thereby augmenting the durability. The Arabian horſes, who are the fleeteſt and moſt durable in the world, are remarkable for their large hocks; in greyhounds it likewiſe forms a characteriſtic; and hence all good judges always regard this part in their purcharſe of a horſe very attentively *. The calcaneum is not placed exactly from the centre of the joint, but rather externally, and this leaves a ſpace on the inner ſide, by which the flexor tendons of the foot with the veſſels and nerves paſs protected from preſſure: inferiorly it articulates by a concave cartilaginous ſurface with the cuboides, and anteriorly it is received into the depreſſions of the aſtragulus. The other four bones are more wedge-like, and only ſerve to increaſe the ſurface of attachment; one of them is called os cuboides, the other three cuneiform. *Cuneiform magnum*, (*vid.* 5, 5) or great wedge like, is placed under the aſtragulus, articulating with it by a concave, and inferiorly by a convex ſurface, reſting upon the middle wedge-like: poſteriorly its internal, as well as part of its inferior ſurface, articulates with the cuboid, which Mr.

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* " The ſtructure of the hock preſents an angular ſpring, " formed by the tibia and the calcaneum, the power of which is " in proportion to its ſhortneſs. At the union of the two branches " of this ſpring originates the fulcrum, which reſts upon the " ground. Theſe branches are extended by the flexor muſcles; " the ſpring is alſo compreſſed by the weight of the body; the " extenſor muſcles reſiſt, but yield at the inſtant of flexion; in " their turn, they repoſſeſs themſelves of the power, by which " they produce in the ſpring of the back an extenſion equal to " the compreſſion it had ſuſtained: for the extenſion, or the ſpring " muſt always be in the ſame direction with the compreſſing " power, and with a force equal to the degree of compreſſion." *St. Bel on the motive Powers of Eclipſe.*

Stubbs

Stubbs calls navicular; it has likewiſe poſteriorly and inferiorly a ſmall ſurface of attachment with the little cuneiform. Immediately behind this, on the outer ſide appears the *cuboid* (*vid.* 6), by its cartilaginous ſurface articulating ſuperiorly with the inferior concave ſurface of the calcaneum, receiving the inferior poſterior edge of the aſtragulus, and reſting inferiorly on the external ſmall metacarpal bone, and part of the canon: it has likewiſe two ſurfaces of attachment with the cuneiform magnum, and one with the medium. The *cuneiform parvum* (*vid.* 8) is ſituated moſt poſteriorly on the inner ſide, immediately under the poſterior internal part of the cuneiform magnum, and over the internal ſmall metacarpal bone. It articulates by a ſmall upper ſurface with the next bone, and projects rather forward, to reſt partly on the canon, but its principal portions articulate with the great cuneiform ſuperiorly, and with the internal ſmall metacarpal inferiorly.

The *cuneiform medium* (*vid.* 7, 7). The greater part of this bone appears on the front of the hock, articulating by its ſuperior cartilaginous ſurface, with the great cuneiform, and inferiorly with the whole head of the canon, or great metatarſal. It is ſlightly triangular, with its acute part pointed poſteriorly, and articulates by a poſterior lateral internal ſurface with the cuneiform parvum, and at the lateral external part with the cuboid.

Though the bones of the hock have all cartilaginous ſurfaces, yet they have but little motion except between the tibia and aſtragulus, and which is confined to flexion and extenſion. Almoſt every bone has peculiar plans of fibres, ſtretching from eminences on its ſurface to the next bone, in every direction, by which means they are individually joined together. The capſular ariſes from the inferior extremity of the tibia, ſtretches backward to inſert itſelf into the calcaneum behind, and before into the ridge of the canon; beſides which, the leſſer bones have peculiar capſules. From the malleoli on each ſide, is a ſtrong common ligament extending laterally over the joint, firmly fixing itſelf to the bone in its paſſage: a plan of this forms likewiſe the annular ligaments, which are portions under which the tendons inſinuate themſelves in their paſſage. The ſhort plan of fibres that extends from the inner and outer ſides of the tibia into the aſtragulus, is very ſtrong; and there is likewiſe a very ſtrong poſterior one from the calcaneum its whole length nearly, paſſing over the cuboid and cuneiform medium, and uniting with the ſmall metacarpal, and poſterior part of the canon. It is the inflammation of this ligament I am apt to believe that occaſions the curb. This joint, it is evident, being ſo complex, is liable to diſeaſe and derangement, and that more particularly in thoſe horſes who are naturally diſpoſed to ſet themſelves, or are taught to throw their weight on their haunches, for in them the greateſt ſtreſs is then laid on this joint: whereas, in the mode of riding uſually practiſed in England, it is more thrown on the ſhoulders and fore feet; hence with us, theſe are the parts that generally firſt fail; but, in France, and the whole of what is called the Continent, where horſes are taught to go much on their haunches, this joint is more liable to ſuffer. I do not remember, during three months reſidence in Holland, to have ſeen three diſeaſed fore-feet. From the great ſtreſs, therefore, laid on this part, the ligaments become inflamed, and as their living powers are ſmall, their tendency to renovate is ſmall likewiſe, and they fall into a dull ſlow inflammation, if it can be ſo termed, that ends in bony matter being thrown out, and the membrane remains thickened, or converted into bone, forming what is called *ſpavin*; which diſeaſe, I believe, uſually begins in the ligament. The mucous capſules likewiſe, in conſequence of this increaſed exertion, are ſometimes becoming inflamed and ſecrete more than before, which forms another diſeaſe of the hock. Theſe capſules ſo dilated by interfering with the ſuperficial veins producing varix, which conſtitutes *blood ſpavin.*

The reſt of the bones of the hinder extremities are ſimilar in nature and number to thoſe of the fore; nevertheleſs, there are ſome ſmall varieties (*ſee Skel.*). The large metacarpal bone, or canon, is longer, and altogether larger than that of the anterior extremity; it is articulated above with the cuneiform medium, and in part with the cuneiform parvum and cuboides; and below with the paſtern and ſeſſamoides. The external ſmall metacarpal is conſiderably larger than the internal, articulating ſuperiorly with the cuboides, and laterally with the canon. The internal is leſs, and articulates above with the little cuneiform, and laterally with the internal edge of the canon; in other reſpects they reſemble the anterior.

The paſtern, or firſt phalanx, is longer than the anterior, and its ſituation leſs oblique: it reſembles in other reſpects the anterior. The ſeſſamoides are two, and do not differ from thoſe before deſcribed. The coronary bone partakes of the form of the paſtern, being likewiſe leſs oblique in its poſition, reſting more on the coffin, and leſs on the navicular than in the front; hence, in the poſterior coffin, the foſſa of articulation is deeper; the reaſon of which appears to be, that as a horſe has frequently to ſupport the whole weight on his hinder extremities, ſo it was more neceſſary that theſe bones ſhould be oppoſed to each other more in a right line, whereby they acquire ſtrength: the loſs of elaſticity occaſioned by this is made up by the formation of the hock, which more than counterbalances it: and, as in action, the natural inclination of the poſterior extremities muſt be much under the animal, to gain the common centre of gravity; ſo had theſe been equally oblique in theſe articulations as in thoſe before, the navicular bone would have been too much preſſed upon, and ruptures, or inflammation in the ſheaths of the tendons, the inevitable conſequence; add to which, that in throwing a horſe on his haunches, his fetlocks would have been brought to the ground; but in the preſent formation, the bony pillar takes off much of that ſtreſs that would have otherwiſe been upon the tendons.

Of the Skeleton conſidered mechanically.

It is evident, that the progreſſion of animals depends principally on the form and direction of the parts forming the baſe of the machine, and we ſhall find that the mechanical ſtructure of the ſkeleton is admirable adapted for giving eaſe and celerity to motion. The horſe preſents a quadrilateral figure, with four ſupporting pillars to an inclined cylinder *, which is not placed in equal lengths upon theſe ſupports, but has the head and neck projected forwards, but which is counterpoiſed by the additional weight in the hinder parts, ſo as to leave the line of direction ſtill near the centre of the whole. The length of a cylinder may be ſuch as not to ſupport its own weight; nature has, therefore, wiſely limited the length of the ſpine in animals, and their general growth: hence, *cæteris paribus*, a ſhort backed horſe muſt be ſtronger than a long one; it is likewiſe upon this mechanical principal, that ſmaller animals can carry proportionably more than larger; as a Shetland poney is infinitely ſtronger than a dray horſe; an aſs likewiſe than a horſe. A dog can carry his own weight, which a horſe could not do. In the bony pillars forming the legs, ſcarce any of the bones are perpendicularly oppoſed to each other, yet it will be found, that a perpendicular from their common centre of gravity, falls nearly in their common baſe; by which means they are ſupported as firmly as though their individual axes had been in a line perpendicular to the horizon. Had they been perpendicularly oppoſed to each other, there could have been but little eaſe or quickneſs in motion; every exertion would have been a jar, and every encreaſed effort a laxation or fracture. This deviation from an upright poſition in the bones, muſt neceſſarily, however, have powers to correct it, and which is done by muſcles; and wherever the angles are found greateſt, the muſcles will be found ſtrongeſt. This muſcular exertion to counterbalance the angular inclination, occaſions fatigue, which is the reaſon one poſture continued for a length of time gives a ſenſe of pain; the ſet of muſcles immediately engaged being weary, the animal is obliged to call another ſet into play, which change is neceſſarily more frequent, as the animal is naturally

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* The human is a perpendicular body, ſupported by two pillars; the ſpine appears as two pyramids joined into one common baſe, and though no where ſtraight, is ſo ingeniouſly contrived, that a perpendicular from their common centre of gravity falls into their common baſe. The human, by this alteration in poſition becomes a much more complex machine.

weaker,

weaker, or more or leſs exhauſted. The extent, therefore, of the action of parts, is the produce of their length, direction, and the different angles they are capable of forming; the force ariſes from the direction, in combination with the agency of the muſcles. The repetition of the action is dependent on the muſcles alone; but as the original action aroſe out of the length and direction of the parts, ſo it will be evident, that in every ſubſequent repetition, it will be more or leſs extenſive, as theſe were more or leſs perfect in their formation, even though the muſcular exertions ſhould be the ſame: hence ſome ſtrong animals cannot move ſo faſt as weaker ones, as the cart horſe and racer, or the greyhound and maſtiff. The power of muſcles is increaſed or diminiſhed as they are ſituated near, or more diſtant from the centre of motion: thus, the bones are uſually ſo placed, as to give the muſcles this advantageous poſition; ſome are formed into angles, as the femur and tibia; others into proceſſes, as the olecranon, calcaneum, &c. Every change in the poſition of a body muſt occaſion a ſimilar one in the centre of gravity: in order to preſerve this, the feet are changed to form a new centre for the moving machine, which forms what is termed the progreſſions the different degrees of celerity of which are called paces *.

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* Mr. Wilkinſon, whoſe ingenious treatiſe on the motive powers of animals I have before had occaſion to mention, and to which I would refer the inquiſitive reader for more extenſive

information, treating of this ſubject has: " The ſcapula in quadru-" peds poſſeſſes a degree of motion round its centre, much greater " than in the human ſpecies, or thoſe animals who uſe their fore-" feet like hands, and conſequently have a clavicle, which horſes, " dogs, &c. have not. Thus unreſtrained by a clavicle, the ſca-" pula has a motion round its centre, in its greateſt extent, of " 20 degrees, and is inclined to a plane perpendicular to the ho-" rizon in an angle of 30 degrees; when the leg is extended, the " angle will be 50 degrees with the plane. The angle the hu-" merus forms with the ſcapula towards the body is 120 degrees, " and is capable of being extended 50 degrees; hence will only " form an angle of deviation of 10 degrees from the continuation " of the ſcapula. The cubitus forms an angle exteriorly, or " from the body, of 130 degrees with the humerus; and in its " extenſion can be brought 40 degrees nearer, ſo as to form a " right angle with that joint. The canon is nearly in a ſtraight " line with the cubitus, and bends inwards, ſo as to make a regu-" lar curvature, in galloping, with the cubitus.

" The paſtern, coronet, and foot, form an angle of 45 de-" grees, with a plane perpendicular to the horizon, when in mo-" tion are in the ſame curvature with the canon.

" A little conſideration of theſe circumſtances will point out " many beauties in the admirable ſtructure of the fore-limbs. We " find that alteration takes place in their direction, ſo as to poſ-" ſeſs ſtrength when ſtrength is required, and freedom of motion " when velocity is neceſſary. In the inactive ſtate of the horſe " the limbs have no other weight to bear than the mere gravity " of the ſuperincumbent matter. When the momentum is in-" creaſed by the rapidity of their motion, when they bound for-" wards with amazing ſpeed, and ſtrike the earth with a propor-" tionate degree of force, how admirably arranged are all the " joints to ſupport the combined effects of action and reaction. " The inſtant before the ground is preſſed by the foot, the cubi-" tus relaxes of its elevatory ſtate, and falls within the line of " curvature of the ſcapula and humerus. The canon and paſtern " all unite, ſo as to make from the centre of motion of the ſca-" pula a continued kind of bony arch, except the deviation of the

" paſtern, which forms at the moment of preſſure an angle of " 45 degrees, nearly parallel with the ſcapula, and conſequently " the beſt calculated for bearing the preſſure of the body when " the whole weight is thus thrown forwards. When this angle " is greater, the ſtreſs muſt be greater alſo, and conſequently an " imperfection of debility in the horſe.

" As then it appears that the horſe ſtrikes the ground with its " fore-feet in the continued degree of curvature of the ſcapula " and humerus, the angle formed with the plane perpendicular " to the horizon will neceſſarily be the ſine of the extent of " ground, in this point of conſideration the animal will cover, as " the vertical angle is 50 degrees, the cathetus 54 inches, the " baſe will be 67 inches, and which is the ground the horſe would " cover, ſuppoſing the poſterior columns or legs have no powers " of flexions; ſimilar to a man being thrown forwards, the ground " he would compaſs would be regulated by the extenſion of the " arms. It has already been obſerved, that the hind legs in no " reſpect correſpond to the fore; every articulation is not only " different in length, alſo differently inclined to each other: if " there was that coincidence Monſieur St. Bel has aſſerted, there " would be great irregularity of motion. In the firſt place, the " ilium is inclined to the perpendicular to the horizon, in an " angle of 50 degrees, while the ſcapula only inclines 30 degrees. " The femur forms an angle towards the body with the ilium of " 120 degrees. The tibia forms poſteriorly, or from the body, " an angle of 120 degrees with the femur. The calcaneum, or " hock, an angle of 40 degrees with the femur, and conſequently " the canon, an angle of 140 degrees towards the body, with " the tibia and paſtern, and 50 degrees from a line perpendicular " to the horizon.

" It is ſaid that Eclipſe's hind legs were ſometimes more for" ward than the anterior limbs; this appears improbable, that " the hind feet ſhould ever advance beyond the line of direction, " which is ſituated 27 inches from the poſterior limbs, being " the line as paſſes through the centre of gravity of the animal " to the centre of the earth. It will eaſily be ſeen what will be

" the ſituation of the limb the inſtant before the motion of the " body: the curve deſcribed by the hind legs will neceſſarily be " reverſe to that delineated by the fore; it will in the former " caſe be concave towards the horſe, while in the latter it is con- " vex. The meaſure of this curve will be from that point of the " earth where the line of direction falls, to where the curve ter- " minates by the extenſion of the legs behind. The femur can " bend forwards towards the body 30 degrees, and poſteriorly " 20 degrees. The tibia can bend backwards 60 or 70 degrees; " its anterior motion is not more than 20 degrees, in conſequence " of being reſtrained by the patella. The canon will admit of " 40 degrees flexion forwards, in ſome reſpects is checked by the " tarſal bones, and poſteriorly will only allow of 30 degrees mo- " tion, in conſequence of the calcaneum."

SECTION IX.

Syndeſmology.

COMPREHENDS all the appendages to bone, as the *cartilages*, *perioſteum*, *medulla*, ligaments, and ſynovia.

Cartilages may be divided into three kinds; *articular*, *nonarticular*, and *temporary*. Conſidered generally, cartilage is a ſmooth, white, ſolid, uniform, elaſtic, ſubſtance, harder than moſt other parts, but leſs ſo than bone, having ſome vaſcularity, though it is apparently but little: a proof of this is their capability of ulcerating; they are likewiſe tinged in jaundice; though, with great difficulty, do they become ſo by an animal's feeding on madder. Their living powers are few, ſo that any proceſs of renovation is ſlow. It is even doubted whether they ever exfoliate, or whether granulations ever appear on them, though authors of repute mention both proceſſes. They are, however, capable of living actions we know by the foregoing proofs, and their ſtrong tendency to become abſorbed, and bony matter thrown out in their room. They are all liable to this bony depoſit, but ſome more than others; as the cartilages of the ribs, and thoſe of the feet. The membrane reflected over them is called *perichondrium.*

Articular cartilages are ſolid, and but little vaſcular, and are of great uſe in the machine: there is uſually a layer or tip on the extremity of every bone intended for motion, by which they ſlide eaſily on one another, by their flexibility accommodating themſelves to the various figures neceſſary in different motions; and by their elaſticity they recover their ſhape, and prevent the effects of concuſſion, which muſt otherwiſe take place between two inelaſtic bodies. There are other kinds of articulating cartilages, but which are not attached immediately to the bones, but interpoſed between them, as the ſemilunar, between the tibia and femur, the temporal, &c.

The *nonarticular cartilages* are but little vaſcular, and have two diviſions into the attached and unattached. The *attached* are numerous, and found placed on the ends of bones not articulated, as the ſpine of the ilium, ſides of the foot, ends of the ſternum, ſupercilia of cavities, as cotoloid of the ſcapula. They are likewiſe interpoſed between bones immoveably joined, as the ſymphyſis pubis, the cartilages between the bodies of the vertebræ, which are of a mixed nature of ligament and cartilage, and thoſe between the ilium and ſacrum. The cartilages of the ribs are of great advantage in giving flexibility to parts that otherwiſe have but little. The ſeptum narium is an inſtance of attached nonarticular cartilage of great uſe, ſerving the purpoſe of bone. The *unattached* are ſuch as ſuſtain parts in the place of bone, without being immediately any part of a bone; thoſe of the ears are a familiar inſtance; the cartilages of the larynx likewiſe form another.

The *temporary cartilages* are thoſe of which the ends of bones are formed in young animals, being very vaſcular, that they may be eaſily abſorbed, and bone formed in their room. The deſcription of individual cartilages will appear in the progreſs of the work, therefore, we ſhall not particularize them here.

The *perioſteum* is a general inveſting membrane to all the bones except the teeth, more or leſs ſtrongly connected to ſome than others. Its origin is diſputed, nor is it to our preſent purpoſe material. It is ſometimes divided into an external and internal; the firſt of which is the general covering to the bones we have mentioned, and which receives different names as it covers different parts, or various bones: that inveſting the ſkull being called *pericranium*; that ſtretched over cartilages *perichondrium*, and when it covers ligaments *perideſmium*.

The *internal* exiſts within the cavities of bones, but appears properly a membrane for the purpoſe of ſuſtaining the marrow, and receiving the arteries that ſecrete it. The uſe of the perioſteum generally, appears that of furniſhing bones with their veſſels, thereby tending to their formation. It has only a ſmall proportion of nerves, yet becomes under inflammation highly ſenſible.

The *marrow* is a ſoft fatty ſubſtance, depoſited in the cavities of the bones, particularly in the long ones, where it exiſts in conſiderable maſſes within the internal membrane, which is ſuſtained by the cancelli of the bones. This fatty matter is ſecreted from large arteries, called medullary. It does not appear that the marrow is in itſelf ſenſible, though many experiments have been made on it, particularly a famous one before the academy at Paris, in which its ſenſibility was apparently proved: but it is now generally received that the membrane only containing it is ſenſible. It is not thought to have any effect, as was anciently ſuppoſed, in nouriſhing bones; nor yet is it ſuppoſed to have any mechanical effect on the bony fibres, in preventing brittleneſs: but that it is ſimply the common fat of the body, placed in the bony cavities for the general ſupport of the animal, and is abſorbed at pleaſure, in common with the other fat in the different ſtates of obeſity and leanneſs: how far this is reconcilable to reaſon, I have before endeavoured to prove.

Ligaments are neceſſary to bones, as a firm connecting ſubſtance uniting them to each other, yet flexible to allow intermediate motion. Ligament is likewiſe a common membrane in every part of the body, but is more particularly appropriate to bones, and is uſually deſcribed with them. They are generally inelaſtic; however, there are ſome exceptions,

ceptions, as the cervical, and thoſe of the metacarpal and metatarſal bones. They appear formed of ſtrong whitiſh fibres, and may be generally divided into connecting and capſular. The *connecting* have endleſs varieties in regard to their form, ſtrength, ſituation, &c. They are uſually found ſtretched from one bone to another, or from one ſoft part to another.

Some ligaments are partaking of the nature of cartilage, and are hence called cartilaginous ligaments, being hard, and but little vaſcular.

The *ſuſpenſory ligaments* are ſuſpending parts, as that of the acetabulum, commonly, but erroneouſly, called the round ligament: thoſe of the liver connecting it to the diaphragm. The ligaments connecting bones are common and proper. The common are ſuch as are generally ſtretched over a part, ſerving to connect the bones, tendons, and veſſels, into one firm joint, as thoſe of the knee and hock. The proper, are thoſe immediately articulating bones together, and are more or leſs tenſe as the part is moveable or immoveable.

The *capſular ligaments* are thoſe that are uſually ſurrounding the two ends of articulated bones, and form a complete cavity within, called the cavity of the joint; and it is the forming of a cavity that appears the principal uſe of this ligament, for it is uſually of ſome length, frequently of no great thickneſs, but always impervious. This kind of ligament is not very ſenſible without, but very ſenſible and vaſcular within; ſecreting from the inner ſurface a mucous called ſynovia. It is from the great ſenſibility of this inner ſurface, that ſuch great inflammation is produced as is uſually attendant on wounds into the cavity of a joint: the internal ſurface ſuffers attrition, from the eſcape of the ſynovia, and the whole ſurface of the joint, which is very large when expanded, becomes irritated and inflamed, forming a wound, and inflamed ſurface, of this extent, under the higheſt poſſible ſtate of irritation: the opening in theſe caſes ſhould, therefore, be immediately cloſed, to prevent theſe effects. (*See wounds in joints.*) I have forebore particularizing the individual ligaments of the body, as I have choſen to deſcribe them with the parts they belong to.

The *ſynovia* is a mucilaginous ſubſtance, ſecreted by the inner ſurface of the capſular ligaments, which are for that purpoſe very vaſcular. Its uſe is very great without it, the attrition between the articulated ends of bones would prevent motion, but by this, they ſlide eaſily over each other. This fluid may be ſecreted in undue quantities, and then forms capſular dropſy. It may poſſibly become otherwiſe diſeaſed likewiſe.

SECTION X.

Myology.

MUSCLE is that part in an animal we term fleſh, in diſtinction from ſkin, griſtle, bones, &c.; and the phenomena it exhibits are ſo univerſal, that it is probable that it exiſts in every animal, though we are not ſo eaſily able to detect it in ſome as in others. Muſcles appear compoſed of reddiſh bundles of fibres laid along ſide of each other, diviſible into leſſer fibrillæ of the ſame figure, but the ultimate diviſion of which it is impoſſible to trace. When theſe bundles are connected together into a determinate form and circumſcribed extent, it is called a muſcle: and as the motions of an animal are very various, and the circumſtances under which they are brought about equally ſo, the peculiar ſhape theſe motive maſſes take on, is as varied. Muſcular fibre is ſpread over the body, and it has been very judiciouſly remarked, that our ideas of it are probably too much limited *: thus, it conſtitutes a principal part of all the viſcera, and enters into the compoſition it is probable of many membranes. But what is more generally underſtood by a muſcle, is a diſtinct body, having its determinate parts.

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* We muſt not conclude thoſe parts only muſcular that are of a red colour; for this ſubſtance is almoſt conſtantly white in fiſhes, inſects, and many fowls; and in what are termed cold blooded

To the generality of muſcles, particularly to thoſe ending in bones, is another part added of a very different texture, called a *tendon*, which is an inſenſible, inelaſtic, fibrous ſubſtance. When this is extended into a thin expanſion, it is called *aponeuroſis*. The ſize of the tendons is not proportionate to that of the muſcles they belong to, and ſome are altogether without any; but in the long ones, flexing and extending the joint, their preſence is highly advantageous, for the ſize of the termination is thereby diminiſhed without the ſtrength being decreaſed, and the parts they run over, as the joints,

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blooded animals: and in ourſelves there are parts where the contractile force is great, without the uſual characterſtic hue, as in the iris, bladder, ſtomach, inteſtines, &c. The hydatid is a tranſparent bag; yet, when put into warm water produces motion, and conſequently muſt be ſuppoſed formed with muſcular fibre.

Dr. Haller ſays fleſhy fibres change into ſuch as are tendinous, for in the fœtus there are but few, but in a child of a few months old a conſiderable number. Dr. Wriſberg, in oppoſition to this, obſerves, that many tendons are obſerved in the fœtus that could not have become ſuch by muſcular action. Profeſſor Soemmering likewiſe ſays, the ſubſtance of muſcular fibre differs totally from that of tendon, and that theſe are united to muſcle by agglutination merely; tendons, therefore, are only the ligaments of muſcles.

left free for motion. Tendons are not very vaſcular, nor can we eaſily detect any nerves in them; their powers of life are conſequently ſmall, and from being ſo little vaſcular are hardly putrefactive, and with difficulty ſlough; nor are they at all ſenſible, but the membrane covering them is very highly ſo under inflammation. A divided tendon, nevertheleſs, both in an aſs and dog has reunited, and a rupture of the tendon achilles in man has frequently done ſo. A muſcle is, therefore, divided into origin, belly, and inſertion, having uſually a fleſhy origin, ſwelling into a body, and terminating in a tendon: but though theſe appearances are by no means eſſential to a muſcle, they are generally thus divided and deſcribed. The vaſcularity of muſcular ſubſtance in general is extreme, their whole colour being derived from the quantity of blood within them; and though it has been ſaid, the immediate action of the muſcle is not dependent on the blood received, and which appears the caſe, yet its ultimate powers are; for when deprived of a part of their blood they become weak; if it is wholly loſt, they wither and die. Muſcles acquire a power of acting dependent on their ſituation, and according to their fixed point; and as theſe points can be varied by the muſcle itſelf, its actions muſt be very various, of which diverſity, ſome by the complexity of their ſtructure appear to be more capable than others. In conſequence of the large quantity of nerves and blood-veſſels they poſſeſs, their living powers are very great[*]. They have the general living powers of all other parts in a high degree; and, beſides which, they own a power peculiar to themſelves, whereby they contract and ſhorten at pleaſure. This power is dependent on the will in the *voluntary* muſcles, and in the *involuntary* on appropriate ſtimuli, as blood ſtimulates the heart, and light the iris[†]. The contractile power of theſe motive organs, has been for ages a ſubject of wonder and diſpute: this diſpoſition to be acted upon by ſtimuli has been called their *irritability*, and exiſts after death, and likewiſe remains in the muſcle on its removal from the body, whence it muſt be inherent in them. If, however, the nerves going to voluntary muſcles are tied, we loſe our power over them, they become paralytic, and incapable of obeying the commands of the will; hence it would appear, that nervous influence is the proper ſtimulus to voluntary muſcles. Till Baron Haller's celebrated doctrine of irritability, two powers had always been aſcribed to muſcles; their general life, and their diſpoſition to contract in obedience to the will; but a principle, independent of this, and peculiar to muſcular ſubſtance, though before hinted at, was not generally received, till this great phyſiologiſt made it ſo much the ſubject of his enquiries. (*See Hiſtory of Medicine, where this is treated more at large.*) The great ſource of difficulty in this ſubject has ariſen from not being eaſily able to define nervous influence as ſeparate from irritability, and this diſtinct from the power of the nerves. *Irritability* is conceived by Haller to be the life of muſcles; a ſtate, or principle, peculiar to themſelves, and independent of the nerves, whereby they have a conſtant diſpoſition to ſhorten themſelves, and to contract on the application of certain ſtimuli. It is adduced as proof, that this is independent of the nerves, becauſe it exiſts in ſome animals that are without a nervous ſyſtem, as in the polipy; and vegetables have likewiſe been brought forward to ſtrengthen it; but though vegetables recede in ſome inſtances from the touch, ſeek the approach of light, or ſhut up and withdraw from rain; yet it is ſuppoſed, they do this from a principle different from irritability. But a ſtronger illuſtration is gained from the exiſtence of the heart and vaſcular ſyſtem in monſters, who have been found without brain; and likewiſe by the diſpoſition remaining in other inſtances, when the communication with the brain has been cut off. This principle ſeems greateſt in thoſe muſcles over which the influence of the will is leaſt; thus the heart, inteſtines, and ſtomach, are more irritable than thoſe muſcles we term voluntary. Nervous power, on the contrary, is ſaid to be the particular power that more immediately acts upon voluntary muſcles, and that though ſenſibility in all is derived from this ſource, yet the power of contraction, and even the diſpoſition, is inherent in themſelves. Nevertheleſs, nerves muſt be allowed to be, in ſome way, the grand exciting cauſe of motion: but in what way it occaſions its phenomena, will probably for ever remain in obſcurity. Dr. Monro has ſaid in oppoſition to the doctrine of irritability, "That if it be as difficult to "point out the cauſe of the action of the *vis inſita*, "as that of the action of the *vis nervea*; the ad-"miſſion of that new power, inſtead of relieving "would add to our perplexity." Again, "We "ſhould then have admitted, that two cauſes of a "different nature, were capable of producing ex-"actly the ſame effect, which is not, in general, "agreeable to the laws of nature." He likewiſe aſks, "If in a ſound animal, the *vis nervea* alone "produces the contraction of the muſcles, what "purpoſe does the *vis inſita* ſerve?" The doctrine of irritability is, however, a very important one, and deſerves the moſt ſerious inveſtigation, promiſing a moſt valuable phyſiological harveſt; and whatever oppoſition it has received, and however eminent the characters and abilities of its opponents, there are ſome of equal talents, that ſuppoſe this principle peculiar to the muſcular fibre is in ſome way diſtinct from nervous influence, and a new genus of animal power: "from which many of the phe-"nomena of life ariſe, and from ſome changes in "which, perhaps, as regarding its quantities more "than its qualities, many of the morbid changes in "the body ariſe. The part of the body having muſ-"cular fibres are called irritable. Theſe differ in "degree; the heart is the moſt irritable, then the "ſtomach and inteſtines, next the diaphragm, and "other muſcles: the degree differs in different "ages of life, and in different temperaments."

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[*] It is a curious fact, but it has been proved, that a muſcle can undergo a complete change within itſelf, dependant on an inherent principle; whereby from the circumſtances of the diſtance between its origin and inſertion being accidentally leſſened; its fibres will bear to be ſhortened to half their original length, and yet can accommodate themſelves to the change, and preſerve the contractile power complete. *Phil. Tranſ. pt.* i. 1795.

[†] Mr. Hunter ſeems to diſſent from this; he ſays muſcular contraction does not appear to be cauſed by any ſtimulus, but often by the ceſſation of ſtimulus. The radii of the eye contract when there is little or no light, in which caſe the ſtimulus of the light is removed; and the ſphincter ani contracts as ſoon as the ſtimulus of relaxation is removed, and may be called the ſtimulus of neceſſity. *Hunter on the Blood.*

Muſcles under action undergo a ſenſible alteration; their bellies become hard, ſwoln, and protuberant, and the whole is ſhorter, but the tendon remains in the ſame ſtate; this is called its ſtate of *contraction:* when not in action, it becomes ſoft, flat, and lengthened; this forms its *reſtitution.* The power with which muſcles contract cannot readily be computed; men in ordinary carry 300 lb. weight, and horſes much more; the muſcles of the jaw exert aſtoniſhing force. This power muſt be immenſe, when we conſider that much the greater part of the force is loſt from the inſertion of all the muſcles, being nearer the centre of motion, than the weights they are applied to.

" The muſcles are likewiſe inſerted at very acute " angles, whence again the effect which the muſcle " exerts in action, is proportionably leſs as the ſine " of the angle intercepted betwixt the bone and the " muſcle is leſs than the whole ſine." The true and original cauſe of this contraction is involved in obſcurity, and has ever been a matter of inveſtigation, as well as diſpute, to the curious; and, perhaps, it will for ever evade our ſearch *. It has been referred to the power of attraction, to a nervous fluid, and to electricity †; which laſt was an

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* Boville takes the fibres of a muſcle to conſiſt of a chain of rhombuſes, or lozenges, whoſe areas are enlarged as the nervous juice is let in or out.

Dr. Croon thought the fleſhy fibre to be formed of a chain of bladders, filled with a fluid, and ſubject to a particular efferveſcence. Dr. Keil again imagined it to ariſe from a rarefaction taking place between the nervous juice and the blood. Many other theories equally vague and indefinite have been formed.

† Dr. Prieſtley has conjectured, that the ſource of muſcular motion is the electric matter, conſidered as a modification of phlogiſton: as a proof, he alleges, that the electric matter directed through the body of any muſcle forces it to contract; that hence the ſource of all muſcular motion muſt be derived from ſome modification of phlogiſton, and that animals have probably a power of converting the phlogiſton, which they receive with their food, into the ſtate of electric fluid; and hence alcohol, which contains this in great proportion, refreſhes much ſooner than moſt other matter.

opinion that has lately been revived, under the term of *galvanic fluid*, but does not appear materially to differ from the general phenomena of electricity *.

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* It has been long obſerved, that ſome perſons are unpleaſantly affected at the approach of ſtorms with ſickneſs, purging, tremors, &c. and which it has been concluded, ariſes from the electric fluid at that time pervading the atmoſphere; and as animal electricity has been found to produce the ſame effects with the influence of the nerves, they are by ſome ſuppoſed one and the ſame; and a wide field of experiment has been entered into under this idea. Independent of the effect of the electric fluid on muſcular fibre, which had been pointed out before by Dr. Prieſtley, and others, it was well known that the torpedo, a ſpecies of fiſh, and the eel of Cayenne, afford ſtrong marks of electricity, giving, on being touched, a very ſtrong ſhock; and which power is voluntary. From hence it has been attempted to be proved, that animal motions are produced by animal electricity: but the more immediate application of the phenomina of the one, to the ſolution of the phenomena of the other, has originated with M. Cotugno of Naples, who, while diſſecting a living mouſe, received a ſhock on touching the intercoſtal nerve with his ſcalpel. Monſ. Galvani, profeſſor of anatomy at Bologna, improved on theſe hints, and from him it has gained the term of Galvanic fluid. Holding up a frog, by means of a hook, whoſe feet reſted on a ſilver baſon; by accident, he touched the baſon, which threw the whole frog into convulſions; another perſon touching the baſon, did not produce the ſame effect, from whence Monſ. Galvani concluded, there was a reſemblance between animal electricity and the Leyden phial, and that the ſame thing took place in each. M. Valli extended theſe experiments, and was led to conclude, that animal electricity not only excites irritability, and puts the muſcles into action, but alſo communicates to them the immenſe force they poſſeſs. Since the above experiments

But whatever is the original cauſe, or in whatever way it is performed, the vital ſtores become conſiderably exhauſted by it; hence we find exerciſe and exertion weaken, and after theſe reſt becomes abſolutely neceſſary; when the voluntary muſcles ceaſing to act renovate themſelves. The involuntary have no reſpite, but their action, though continued, is ſmall in proportion to their power. They, however, can become weakened, of which the heart forms a ſtrong inſtance, when, from any obſtruction to the paſſage of the blood from the right ſide, it becomes diſtended; the force it applies to overcome this reſiſtance is at firſt great, but ſoon it becomes ſo much exhauſted, as that the contractions are moſt feeble, occaſioning a weak and quick pulſe, which is an uſual ſymptom of diſtention of this kind.

Muſcles are called voluntary and involuntary.—*Voluntary muſcles* are ſuch as are immediately under the influence of the will, as thoſe of the arms, legs, eyes, mouth, &c. *Involuntary muſcles*, are ſuch as are not under our guidance, and whoſe functions go on without controul, as the heart, the reſpiratory and digeſtive muſcles: nevertheleſs, it has been obſerved, that the heart is the only true involuntary

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ments were made public, Mr. Fowler has occupied the attention of thoſe who were engaged on this curious ſubject, and detailed a ſet of facts, by which he attempts to prove, that this influence has no reſemblance to electricity.

muſcle in the body. Voluntary muſcles have uſually antagoniſts, whereby the perpetual tendency to contraction is counterbalanced: they are likewiſe the whole of them generally ſituated in a fatty matter, and have it interpoſed between their fibres, and commonly thus are inveſted by a cellular, or membraneous covering, which in ſome inſtances is very denſe, called *faſcia*, whereby they are bound down and aſſiſted in their action. The tendons in moſt caſes have a *theca*, or ſheath, ſurrounding them, by which they are prevented from riſing during action, and by which, from having a fluid interpoſed, the effects of friction are prevented. At their extremities there is uſually a tendinous *capſule*, containing a quantity of mucus, the increaſed collection of which forms windgall. The fibres of muſcles are laid in different directions according to their form, and their intended uſes: when theſe take all one direction, it is termed a *ſimple muſcle*; when in different ones, a *complex muſcle*. They are named likewiſe, according to their figure, and even their ſituation, influences their appellations; hence we have *penniform*, when a tendon is interpoſed in the middle of a muſcle, and the fibres inſerted obliquely on each ſide: *digaſtric* when an intermediate tendon has a muſcular portion at each end, with numerous other arbitrary diſtinctions, which will appear in the courſe of the work. The fleſhy parts of animals have been converted into a ſubſtance reſembling ſpermaceti: the human muſcles ſo changed reſemble very intimately the moſt genuine kinds.

The accurate deſcription of organs ſo complex and numerous as the muſcles, is by no means an eaſy taſk; particularly in an animal, whoſe anatomy has but lately made any progreſs among us. I have diſſected much, and paid conſiderable attention to the muſcles in general; but as I conſidered thoſe of the extremities as of more conſequence than thoſe of other parts, they attracted moſt of my notice: and though I have gone over the others, yet, as I have not ſatisfied myſelf of any perfect correctneſs, ſufficient to claſs, divide, and name them as I have thoſe of the extremities, I will not run any chance of palming error on the ſtudent, by giving a mutilated myology, but at once preſent Bourgelat's diviſion and nomenclature of the muſcles of the head and trunk, reſerving to myſelf the liberty, which it will be obſerved, I have very frequently taken, of correcting in the notes what I have obſerved erroneous. By this means, I hope, that the table of muſcles will be, at leaſt, more perfect than any plan yet made public: at the ſame time, I muſt remark, that particularly in this branch of anatomy, this celebrated author is uſually very correct; and I would recommend his elementary work to any pupil beginning diſſection. As my attention has been turned particularly to the myology of the extremities, it will be found I have there differed from every one who has gone before me. The muſcles of the back will, to any future diſſector be found very complex. I may here add, that I would not adviſe any ſtudent, who is diſſecting for muſcles, to trouble himſelf with references to numerous authors, or he will probably become, what with different nomenclatures, a variety in the mode of deſcription, and perhaps, the diviſion of one muſcle into two or three portions, ſo bewildered as to turn with diſguſt from ſo rugged a taſk: but I would recommend the ſtudent, if at all advanced in anatomy, and alert in the proceſs of diſſection, to make uſe of no reference, but carefully to mark every muſcle with its origin, attachment, inſertion, with his own ideas of the uſes, and afterwards to compare this with the authors moſt to be depended upon. But if he is not ſufficiently acquainted with general diſſections, and has but little general knowledge of parts, it would be prudent for him to uſe ſome one guide; and this, if he is not able to procure any of the beſt authors on veterinary medicine, may be done by taking Innes's tables of the human muſcles, carefully marking the varieties, and which he will ſoon gain a clue to; for they are more dependent on the ſituation of the animal, and his having one phalange, than on any other grand peculiarity.

When the muſcles are ſingle, that is, where there is only one muſcle of that kind in the body, I ſhall mark it with a ſtar; therefore, whenever this does not appear, the muſcle deſcribed is to be conſidered as one having a fellow, or one muſcle of a pair. It ſhould likewiſe be conſidered in their uſes, that where there are pairs of muſcles, that they have a power either of acting jointly, or diſtinctly; this ſhould, therefore, be conſtantly kept in mind when conſidering their uſes, muſcles acting alone will often produce a very different action, than the two acting together, many flexors, by acting diſtinctly, become adductors, &c. &c.

MYOLOGY.

Muſcles of the external Ear.[*]

Name.	*Origin.*	*Inſertion.*	*Uſe.*
Firſt.	From the ſuperior part of the ſkull at the ſpine of occipital parietal and frontal bones.	Into the ſide of the ear.	To draw the ears together.
Second.	At the ſpine of the occipital.	The baſe of the ear.	Aſſiſting the firſt.
Third.	At the poſterior part of the occipital bone.	The poſterior part of the baſe of the ear.	Draws the ear backwards.
Fourth.	Below the preceding.	The moſt inferior part of the ear.	Draws the ear outwards and downwards.

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[*] Theſe muſcles, it is evident, are very improperly named as thereby their uſes are not characteriſed, nor yet is this diviſion correct; yet I purpoſely in this place forbear any further deſcription of them. The following references beſpeak the name of theſe muſcles in the human myology. I have given them for eaſe to the ſtudent diſſecting with a reference to the human muſcles.

Name.	*Origin.*	*Inſertion.*	*Uſe.*
Fifth.	By a thin expanſion from the parotid gland.	At the anterior part of the baſe of the ear.	Draws the ear forward and outward.
Sixth.	At the internal part of the cartilage ſituated in front of the ear.	At the poſterior and inferior part of its baſe.	Draws the ear backwards and aſſiſts the ſecond.
The Muſcles of the internal Ear are four; three to the Malleus and one to the Stirrup.			
Firſt*.	At the ſuperior part of the bony meatus.	Into the handle of the malleus	To draw the malleus forward, and to relax the tympanum.
Second†.	External part of euſtachian cavity.	Long proceſs of malleus.	To lighten the membrana tympani.
Third.	Internal part of euſtachian cavity.	Baſe of the long proceſs of the malleus.	Aſſiſts the former.

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* Laxator tympani.

† Tenſor tympani.

Name.	*Origin.*	*Inſertion.*	*Uſe.*
Stapedius.	The petrous canal near the bottom of the cavity of the tympanum.	To the ſtapes.	To elevate the baſe of the ſtapes and ſhut the oval opening.
		Muſcles of the Eyelids.	
Orbicularis palpebrarum.*	Around the internal ſurface of the ſkin of the eyelids.	By a tendon to the angular proceſs.	To ſhut the eye.
Levator palpebræ ſuperioris.	Around the bottom of the orbit.	Into the ſuperior part of the tarſus.	To open the eye.
		Muſcle of the Eye.	
Levator occuli.† Depreſſor occuli. Adductor occuli. Abductor occuli.	From the bottom of the orbit.	The anterior part of the ſclerotic coat, oppoſite to each other.	To draw the eye upwards, downwards, inwards and outwards.

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* This muſcle is very difficult to demonſtrate without great care ; it is commonly raiſed with the ſkin.

† Theſe muſcles will be more fully explained when we treat of the eye.

Name.	*Oxigin.*	*Inſertion.*	*Uſe.*
Obliquus major, ſeu trochlearis*.	From the bottom of the orbit, paſſes through a pulley-like proceſs.	Superior and anterior part of the globe.	To turn the eye on its axis and carry it forwards and downwards.
Obliquus minor†.	Near the ductus naſalis.	The back part of the eye.	Directs the eye forwards and upwards.
Orbicularis or retractor.	From around the optic foramen, ſurrounds the optic nerve.	The poſterior part of cornea tranſparens.	To draw the eye into the orbit.
		Muſcles of the Lips.	
* Orbicularis.	Around the mouth and is thus forming a ſpecies of ſphincter.		To ſhut the mouth and contract the lips and likewiſe to contract the noſtrils.
External molar‡.	Anterior part of coronoid proceſs.	Internal membrane of the mouth.	Various actions of the lips and mouth.

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* Obliquus ſuperior.

† Obliquus inferior.

‡ Buccinator.

Name.	*Origin.*	*Inſertion.*	*Uſe.*
Internal molar[*].	From the ſuperior maxillary bone and poſterior maxilla.	The commiſſure of the lips.	Performs jointly with the others in elevating the angles of the mouth.
Cutaneous.	From the external ſurface of the maſſeter muſcle by an aponeuroſis.	By two portions to the commiſſure of the lips.	Aſſiſts in elevating the mouth.
Levator[†].	Below the orbit near the junction of angular, maxillary, and malar bones.	By an aponeuroſis uniting with its fellow into the anterior part of the upper lip.	To raiſe the lip.
Maxillary[‡].	From the maxilla ſuperior and angular bone, below the preceding.	By two portions to the angle and anterior part of the upper lip.	Aſſiſts the former.

[*] Levator anguli oris. [†] Levator anguli oris. [‡] Pyramidalis, or ſecond portion of levator labii ſuperioris. *Winſlow.*

Name.	*Origin.*	*Inſertion.*	*Uſe.*
Middle anterior*.	From the alveolary edge at the upper inciſive teeth.	In the upper lip.	To depreſs the lip.
Levator inferior†.	At the external part of the poſterior jaw near the molar teeth.	In the ſkin of the chin.	To elevate the under lip.
Middle poſterior‡.	The alveolary edge of the under inciſive teeth.	In the lower lip.	To depreſs the lip.
		Muſcles of the Noſe.	
Tranſverſal.	From the naſal ſpine.	To all the cartilage forming the noſe.	
Pyramidal.	By a thin expanſion, from the middle and external part of the ſuperior maxillary bone.	To all the external circumference of the noſtrils.	

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* Depreſſor labii ſuperioris.

† Levator labii inferioris.

‡ Depreſſor labii inferioris.

Name.	*Origin.*	*Inſertion.*	*Uſe.*
Brevis.	From the lateral external part of the noſe.	Into the ſkin of the falſe naſal foſſa.	
Cutaneous.	By the groove at the anterior edge of the maxillary bone, forming the entrance of the noſtrils.	Into the ſkin and falſe naſal foſſa.	All theſe muſcles operate in opening the noſe.
	Muſcles of Poſterior Jaw.		
Maſſeter.	From the maxillary and zygomatic ſpine.	At the external edge of the tuberoſity of the poſterior jaw.	To ſhut the jaw.
Crotaphite*.	From the frontal, parietal, and occipital bones; filling up the cavity called the eye-pits.	By a ſtrong tendon to the coronoid proceſs of the poſterior jaw.	It aſſiſts the maſſeter.

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* Temporalis. This muſcle is covered by an aponeuroſis ariſing from the bone above its origin, which ſerves to ſtrengthen it.

Name.	*Origin.*	*Inſertion.*	*Uſe.*
Spheno maxillary.	From proceſſes in the ſphenoid and palatine bones.	To all the internal ſurface of the poſterior jaw oppoſed to the maſſeter.	It acts with the former in contracting the jaws: when only one is in action, it muſt draw the jaw to one ſide and ſo with the others, aſſiſting maſtication.
Stilo maxillary.	By ſtrong attachment to the ſtiloid proceſs of the occipital.	To the tuberoſity of the jaw.	Draws the jaw backwards, and conſequently opens the mouth.
Digaſtric.	From the extremity of the above proceſs.	To the inner ſurface of the jaw near its ſymphyſis.	Acts in concert with the other.
Muſcles proper to the Head performing its Motions.			
Sterno maxillary.	From the point of the ſternum.	To the tuberoſity of the poſterior maxilla.	Brings the head downwards, and aſſiſts in opening the mouth.

Name.	*Origin.*	*Inſertion.*	*Uſe.*
Long flexor*.	By little tendons from the tranſverſe proceſſes of the third, fourth, and fifth cervical vertebræ.	To the cuneiform proceſs of the occipital.	
Little flexor.	From the lateral part of the body of the firſt cervical vertebra.	To the ſtyloid proceſs of the occipital.	
Short flexor.	From the firſt cervical vertebra.	To behind the cuneiform proceſs of the occipital.	Theſe three muſcles flex or bend the head.
Splenius.	From the ſpinous proceſſes of the 2d, 3d, 4th, and 5th dorſal vertebræ; from the cervical liga-	By an aponeuroſis to the maſtoid proceſs.	To bring the head backwards.

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* Longus colli.

Name.	*Origin.*	*Inſertion.*	*Uſe.*
	ment, and by another portion from the firſt five cervical vertebræ.		
Complexus major.	From the ſpinous proceſſes of the 2d, 3d, and 4th dorſal vertebræ, to the firſt ſix tranſverſe proceſſes of the ſame, and the laſt five cervical vertebræ.	Into the tranſverſe protuberance of the occipital bone.	To draw the head backward and to one ſide.
Complexus minor*.	From the tranſverſepro ceſſes of the 3d, 4th, and 5th cervical vertebræ, and by another part from the 6th, and 1ſt, of the back.	Into the maſtoid proceſs of occipital.	To aſſiſt the former.

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* Trachelo maſtoidæus or maſtoidæus lateralis. It is divided into two parts; Bourgelat deſcribes the lower with the complexus major.

Name.	*Origin.*	*Inſertion.*	*Uſe.*
Rectus capitis major.	From the ſuperior part of the ſpinous proceſs of the 2d cervical vertebra.	To the poſterior part of the occipital bone.	To move the head backward.
Rectus capitis minor.	From the 1ſt cervical vertebra, and the edge of the articular cavity.	To below the condyles of the occipital.	It aſſiſts the former.
Obliquus major*.	From the ſpine of the 2d. cervical vertebra.	To the tranſverſe eminence of the firſt.	To draw the head backward and rotate it.
Obliquus minor†.	Brom the tranſverſe proceſs of the 1ſt cervical vertebra.	To the lateral traanſverſe eminence of the occipital.	To aſſiſt the former.
	Muſcles of the Os Hyoides.		
Mylo hyoideus.	From the internal part of the poſterior jaw.	To the appendix of the bone.	

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* Obliquus capitis inferior.

† Obliquus capitis ſuperior.

Name.	*Origin.*	*Inſertion.*	*Uſe.*
Genio hyoideus.	From the inferior part of the concavity of the jaw.	In the ſame manner with the preceding.	Theſe two muſcles bring this bone forwards and depreſs it.
Sterno hyoideus.	From the point of the ſternum.	To the anterior part of the body.	
Hyoideus*.	From the internal ſurface of the little pectoral.	With the preceding.	Theſe two muſcles carry the os hyoides backwards.
Stylo hyoideus.	From the point or ſuperior extremity of the long branches of this bone.	To the lateral part of its body, permitting the tendon of the digaſtric to paſs through it.	Draws the body of the bone upwards and ſideways.

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* This muſcle ſhould be coraco hyoidæus, as its origin from the humerus, and has two inſertions ; one into the ſphenoid, as well as one into the os hyoides.

Name.	*Origin.*	*Inſertion.*	*Uſe.*
Cerato-hyoideus.	From the little branches of the bone.	To the inferior part of its large branches.	
* Arytænoideus tranſverſus.	From each ſide of the little branches of the bone, ſo that the fixed point is in the middle of the muſcle.	To the inferior part of its large branches.	To draw the branches together.
	Muſcles of the Tongue.		
Genio gloſſus.	From the inferior part of the concavity of the jaw.	To the baſe of the tongue.	To draw the tongue out of the mouth.
Baſio gloſſus.	From the body of the os hyoides.	To the baſe of the tongue.	To draw the tongue inwards and backwards.
Hyogloſſus.	From the external and inferior part of the grand branches.	To the baſe of the tongue.	To draw the tongue ſideways and backwards.

Name.	*Origin.*	*Inſertion.*	*Uſe.*
Muſcles of the Larynx.			
Sterno thyroideus.	From the point of the ſternum dividing into two portions.	The anterior and lateral part of the thyroid cartilage.	Draws the larynx downwards.
Hyo-thyroideus.	From the lateral part of the body of the os hyoides.	To the edge of the thyroid cartilage.	Raiſes the larynx.
Cricothyroideus.	From the lateral external part of the cricoid cartilage.	To the inferior edge of the thyroid cartilage.	To draw the thyroid and the cricoid cartilages together.
Crico arytænoideus poſticus.	From the poſterior ſurface of the cricoid cartilage.	To the inferior part of the arytenoid cartilage.	To dilate the glottis.
Arytenoideus.	From the poſterior part of the larynx and from one arytenoid cartilage to the other.		

Name.	*Origin.*	*Inſertion.*	*Uſe.*
Crico arytenoideus.	From the ſuperior edge of the cricoid cartilage.	To the lateral external part of arytenoid.	
Thyreo arytænoideus.	From the internal and middle part of the thyroid cartilage.	To the lateral part of the arytenoid.	Theſe three muſcles ſhut the glottis.
Hyo-epiglottideus.	From the baſe of the appendix of the os hyoides.	To the convexity of the epiglottis.	It elevates the epiglottis and dilates the glottis.

Muſcles of the Pharynx.

Pterigo palato pharyngeus.	From the palatine and pteregoid proceſſes of the ſphenoid bone.	To the ſuperior part of pharynx.	
Cerato pharyngeus.	From the internal part of the great branches of hyoides.	To the pharynx below the preceding.	Theſe muſcles dilate the pharynx, drawing it from before backwards.

Name.	*Origin.*	*Inſertion.*	*Uſe.*
Hyo-pharyngeus.	From the lateral part of the body of the hyoides.	To the poſterior part of the pharynx.	
Thyreo pharyngeus.	From the thyroid cartilage.	To the poſterior part of the pharynx.	
Crico pharyngeus.	From the crycoid cartilage.	As above.	Theſe three muſcles ſtraighten the pharynx by drawing the parts together.
Arytæno pharyngeus.	From the inferior part of the arytenoid cartilage.	In the pharynx.	It ſupports the pharynx.
* Oſophageus.	Ariſes and terminates in fleſhy fibres on each ſide of the pharynx.		To ſhut the pharynx and thereby facilitate the deſcent of the maſticated bolus.

Name.	*Origin.*	*Inſertion.*	*Uſe.*
	Muſcles of the Velum Palati and Euſtachian Cavity.		
Pereſtaphelini externus*.	From the ſtyloid proceſs of the temporal bone, and euſtachian cavity paſſes the pulley-like proceſs of the pteregoid apophyſis.	To the inferior part of the velum palati.	
Pereſtaphelini internus.	Ariſes with the preceding.	With the above.	Theſe muſcles elevate the velum palati.
Velo palatine.	By a thin tendon to the palatine bones or their juncture.	Into the inferior and middle part of the velum palati.	This muſcle aſſiſts the others.

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* Circumflex, ſeu Tenſor palati.

Name.	*Origin.*	*Inſertion.*	*Uſe.*
Muſcles of the Neck.			
Scalenus*.	By two portions; one conſiderable one from the external ſurface of the 1ſt, rib, the other from the 4th, 5th, 6th, 7th, tranſverſe proceſſes of the cervical vertebræ.	To the lateral anterior part of the bodies of the 7th, 6th, 5th, and 4th cervical vertebræ.	When the rib is the fixed point it bends the neck; when the neck is fixed it aſſiſts reſpiration.
Flexor longus.	By numerous muſcular fibres from the ſixth dorſal to the firſt cervical vertebræ.	By a tendon common to the two muſcles, to the middle and anterior eminence of the firſt vertebra of the neck.	This muſcle bends the neck.

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* The ſecond portion of this in the human is the ſcaleus medius.

Name.	*Origin.*	*Inſertion.*	*Uſe.*
Tranſverſalis longus.	From the tranſverſe proceſſes of the firſt dorſal and the five laſt cervical vertebræ.	By a tendon which unites with that of the ſplenius and common muſcle.	It bends both head and neck.
Tranſverſalis brevis.	From the tranſverſe proceſſes of the five firſt vertebræ of the back by ſo many ſmall tendons.	To the tranſverſe proceſſes of the laſt cervical vertebræ.	To extend the neck.
Spinatus longus.	The ſuperior part of the ſpinous proceſſes of the firſt 13 dorſal vertebræ; and by tendons which are united to thoſe of the long dorſal.	To the ſpinous proceſſes of the three laſt cervical vertebræ.	

Name.	*Origin.*	*Inſertion.*	*Uſe.*
Spinatus brevis.	Inferiorly by tendons from the ſpinous and oblique proceſſes of the firſt dorſal, and the five laſt cervical vertebræ.	By a ſtrong tendon to thoſe proceſſes of the ſecond cervical vertebræ.	This and the above extend the neck.
Cutaneous*.	From the cervical ligament covering all the muſcles of the neck, of the	By uniting with its fellow in the front of the neck, oppoſed to the tra-	A ſpecies of panniculus carnoſus to the neck.

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* This conſiderable expanſion is to be regarded as a muſcle of the ſkin of the neck; as the cutaneous deſcribed among the muſcles of the noſe, is to the ſkin of the face (See Panniculus carnoſus). This is the firſt muſcle that appears on raiſing the ſkin of the neck, and is attached by aponeuroſis to the ſpine of the ſcapula; and very intimately to the common muſcle. Theſe two muſcles have been deſcribed, I believe as one, under the name of Levator humeri; and from its inſertion and origin it does appear, that this is a more proper deſcription of it; at the ſame time that it muſt be allowed the upper portion can corrugate the ſkin, and that there is a line of diviſion between it, and the part Bourgelat calls the common; I ſhall therefore at preſent continue this diviſion.

Name.	*Origin.*	*Inſertion.*	*Uſe.*
	head, and part of the ſcapula, united with the common muſcle.	chea, and to the point of the ſternum.	
Inter-tranſverſales.	From the interval between all the tranſverſe proceſs of the cervical vertebræ except the firſt.		Aſſiſts in the bending of the neck.
Muſculus communis*.	From the inferior and anterior part of the arm paſſing to the point of the	By one portion having ſeveral tendons, into the 2d, 3d, 4th, and 5th tranſ-	To move the head, neck, or arm, according to its fixed point.

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* The common muſcle is ſo called as being common to the head, neck, and arm; this and the cutaneous has been conſidered by ſome Engliſh veterinarians as one, the levator humeri. This portion can act upon either as its fixed point is altered. Bourgelat deſcribes it as giving off a part at the point of the ſhoulder to the ſternum; but this part is evidently a diſtinct muſcle, the ſterno brachialis: nor is it inſerted ſo low or attached ſo low in the arm as he deſcribes, though its aponeuroſis extends downwards in union with the aponeuroſis of theſe parts.

Name.	*Origin.*	*Inſertion.*	*Uſe.*
	ſhoulder, when the body paſſing up the neck divides into two portions.	verſe proceſſes of the cervical vertebræ. By another into the tuberoſity at the petrous part of the temporal bone.	(*See Muſcles of Arm.*)
	Muſcles of the Back and Loins.		
Longiſſimus dorſi.	From the outer criſta of the ilium, the tranſverſe and ſpinous proceſſes of all the lumbar vertebræ, and from the ſpinous proceſſes of the five laſt dorſal.	By fleſhy portions into the upper part of the ribs, and by tendons into the tranſverſe proceſſes of all the dorſal, and the two laſt cervical vertebræ.	To ſtretch the vertebræ, and to draw the trunk upwards, therefore it muſt be of great uſe in rearing, galloping, leaping, &c.

Name.	*Origin.*	*Inſertion.*	*Uſe.*
Inter-tranſverſales.	Theſe are ſmall muſcles whoſe number is equal to the dorſal and lumbar vertebræ, ſituated obliquely on each, from behind forward, extending from the tranſverſe proceſs of one, and from the ſpinous of the other from the ſacrum.		To draw the ſpinous and tranſverſe proceſſes together, aſſiſting in the flexion of the back.
Interſpinales.	Theſe occupy the interval which the ſpinous proceſſes leave between them.		To aſſiſt in the motions of the ſpine.

Name.	*Origin.*	*Inſertion.*	*Uſe.*
Pſoas lumbaris*.	From the lateral part of the bodies of the three laſt dorſal vertebræ, and the four firſt lumbar.	To the inferior and internal part of the ilium near the cotoloid cavity,	It is an antagoniſt to the long dorſal, ſerving when the animal riſes to bring the body down again; when on the contrary, he riſes behind, the point that was before fixed now becomes the moveable point, and the hinder parts are brought forward by it. It acts in concert with the muſcles of the lower belly, and aſſiſts in various motions

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* Pſoas parvus.

Muſcles of Reſpiration.

The muſcles uſed in reſpiration are common and proper. The firſt are thoſe whoſe uſe is common to this function, and to the motions, of other parts: the proper are thoſe only uſed in the elevation and depreſſion of the ribs, or the enlargement of the cavity of the cheſt (*See Reſpiration*). The proper are,

Name.	*Origin.*	*Inſertion.*	*Uſe.*
Levatores coſtarum*.	Theſe are five to each ſide; ariſing, the firſt from the tranſverſe proceſs of the ſecond dorſal vertebra; the ſecond from that of the third, and ſo on.	The firſt to the anterior and ſuperior part of the third rib: the ſecond to the fourth, and ſo on with the reſt.	To elevate the ribs.

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* Theſe in the human are only conſidered as portions of the intercoſtals.

Name.	*Origin.*	*Inſertion.*	*Uſe.*
Intercoſtals external and internal.	They fill up the intervals between the ribs, and are croſſing each other, the two plans being ſeparated by a cellular tiſſue; the external ariſing from the poſterior acute edge of each anterior rib, the whole length, pointing obliquely from downward upward; and the internal in the ſame manner, but under theſe, and point obliquely from above downwards.	Both external and internal into the ſinuoſity of each poſterior rib.	To elevate the ribs, acting on the firſt which being immoveable is thus the fixed point.

Name.	*Origin.*	*Inſertion.*	*Uſe.*
Tranſverſalis.	From the external ſurface of the firſt rib paſſes over the 2d and 3d.	To the external ſurface of the fourth.	It aſſiſts in elevating the cheſt.
Sterno coſtalis.	From the internal ſurface of the ſternum.	By a tendinous production to the cartilages of the true ribs.	Is ſimilar to the former.

The muſcles common to inſpiration are,

Serratus longus.	By two portions, the anterior by an aponeuroſis from the ſpinous proceſſes of the 12 firſt dorſal vertebræ, the poſterior by a ſimilar aponeuroſis to the ſpinous proceſſes of the lombar and of the fix laſt dorſal vertebræ.	By fleſhy digitations to the four laſt true, and the four firſt falſe ribs; and by ſimilar digitations to the poſterior edge of the 7th or 8th laſt falſe ribs, digitating with the poſterior ſerrated portions of the great oblique; and by	When the ſhoulder is fixed, it acts on the cheſt, and when that is fixed it moves the ſcapula. (*See Anterior Extremities.*)

Name.	*Origin.*	*Inſertion.*	*Uſe.*
		a very ſtrong portion to the internal part of the ſcapula.	
Intercoſtalis communis.	From the tranſverſe proceſſes of the lombar vertebræ.	By tendons to all the ribs at the ſuperior part of their poſterior edge.	To elevate and depreſs the cheſt.
* Diaphragm.	This is a moſt important muſcle not only to the cheſt, but to the belly, and will be deſcribed at large, in treating of the cheſt. (*See Splanchnology.*)		

Muſcles of the Abdomen.

The parietes of the abdomen are formed by four pair of muſcles.

Obliquus magnus. ſeu Obliquus abdomi-	Is the moſt external of theſe muſcles, but is not ſatisfactorily deſcribed by Bourgelat. It ariſes by fourteen or fifteen fleſhy appendixes from the fourteen or fifteen laſt ribs, ſome of which intermix in a ſerrated manner with the digi-

Name. *Origin.* *Inſertion.* *Uſe.*

nis externus. tations of the ſerratus muſcles. It is likewiſe ſtrongly attached to the ſpine of the ilium from the laſt rib, and is covered laterally by the latiſſimus dorſi, and adheres anteriorly to the pectoralis and intercoſtal muſcles. From theſe origins and attachments it is continued down tendinous, confounding itſelf with the tendinous parts of the leſſer oblique and tranſverſe, and meeting its fellow is united with it from the ſternum to the ſymphyſis pubis; forming a white line, thence called *linea alba.* Its junction by this means, is ſo intimate that it might be regarded as a biceps muſcle, with as much propriety as a diſtinct pair. About the middle of the linea alba in the fœtal colt, it is perforated by the umbilicus or naval ſtring. The tendinous portion attached to the ſpine of the ilium is not continued in its attachment from thence to the ſymphyſis, but forms a ſtrong band which is unattached for ſome ſpace, and then is inſerted into the pubis; this is called *Fallopius's* or *Poupart's ligament.* This unattached portion is conſequently leaving an opening, and under it paſs the crural veſſels going to the extremities, from which any of the contents of the abdomen protruding with theſe, is called crural hernia.

This expanſion of the external oblique forms a ſpecies of tendinous doubling, but not a complete abdominal ring, as it is called in the human. Through this the ſpermatic chord of the male and the round ligaments of the womb in mares paſs obliquely between the internal and external oblique, for an inch and half before either chord or ligament turns into the pelvis. It will therefore be evident, that when ſtrangulated hernia takes place in the horſe, it can only happen in the mouth of the ſac before Poupart's ligament, under the obliquus externus tendon; but in conſequence of the horizontal ſituation of the animal, hernia at the abdominal ring is very rare: the abdominal contents reſt more on theſe muſcles, and hence render him more prone to umbilical hernia: nevertheleſs in fat lap dogs, it is not unuſual for the omentum to fill the ſcrotum. The contents of the abdomen may likewiſe now and then be protruded under Poupart's ligament, and under the expanſion that the external oblique gives off, or connects itſelf to, of the thigh. This ſpecies is called inguineal hernia, and of which the celebrated horſe Mentor died; though it is a very rare inſtance.

Name. *Origin.* *Inſertion.* *Uſe.*

Obliquus parvus, ſeu obliquus abdominis internus.

The fibres of this muſcle have a contrary direction to the preceding, being ſituated obliquely from above downwards, and from behind forwards; it ariſes from the inſide of the falſe ribs by tendinous origins, and ſuperiorly by a ſimilar aponeurotic expanſion with the external; poſteriorly it originates from the anterior angle of the ilium; it is then continued, but not exactly in the ſame manner as in the human, and is inſerted tendinous into the linea alba, the whole length of that line, and into the inſide of the pubis. Its tendon permits the paſſage of the ſpermatic chord over its edge; and as it paſſes, is gives off ſome muſcular fibres to form the cremaſter muſcle, frequently in conjunction with the tranſverſalis.

The uſes of theſe two muſcles, it muſt be evident, are various and important; they tend to ſupport the abdominal contents, and very forcibly act in the expulſion of the fæces, and in the delivery of the foal from the womb; they are likewiſe, there is little reaſon to doubt, though Winſlow denied it, very conſiderable auxilaries in reſpiration, expelling the air from the lungs by leſſening the cavity of the belly, and thus forcing up the diaphragm. They are probably no leſs important in other motions, and in progreſſion. When one of each of theſe muſcles acts without its fellow, the body muſt be ſtrongly drawn to one ſide, as when a horſe bites his heels, or is trotting in a circle, &c. In progreſſion, when the body is elevated particularly in galloping, they bring the pelvis and hind legs under the centre of gravity of the body; that is, they double thoſe parts under the animal, acting with the pſoas muſcles. In their relaxation the muſcles of the back become antagoniſts to them.

Tranſverſalis, This muſcle has a ſpecies of diviſion that properly forms it into two to each ſide, which originate by an aponeuroſis from the tranſverſe proceſſes of the lumbar vertebræ; poſteriorly from the ſpine of the ilium, expanding on the poſterior and lateral part of the belly, extending up to the internal edge of the falſe ribs, and to the xiphoid cartilage, where it begins its inſertion into the linea alba, and continues it poſteriorly. It aſſiſts forcibly in the compreſſion of the abdomen.

Name.	*Origin.*	*Inſertion.*	*Uſe.*
Rectus abdominis	Ariſes from the pubis, one on each ſide of the linea alba, and is expoſed on removing the external oblique; it grows rather broader and thinner, as it advances; but again narrows to inſert itſelf into the cartilages of the laſt five or ſix true ribs by fleſhy and tendinous portions. Theſe muſcles appear only as fleſhy bands in front of the abdomen, of about half a foot in breadth, interſected by tendinous lines in a ſimilar manner with the human rectus; only that in the horſe there is ſix, ſeven, or eight of theſe tranſverſe tendinous interlineations, inſtead of three which exiſt in ourſelves. The uſe of theſe interſections of tendinous fibre is for the purpoſe of ſtrengthening the muſcle, which otherwiſe from its great length would be weak; and hence the ſuperior number of theſe lines in the horſe is accounted for; the additional length requiring this additional ſupport. This pair of muſcles, it is evident, muſt operate in ſupporting and preſſing the abdominal contents. The whole likewiſe of the muſcles of the abdomen afford a proof of the great living powers organs poſſeſs, and the great degree of diſtention even tendinous parts are enabled to recover, which as uſually deſcribed are perfectly inelaſtic: yet in pregnancy		

Name.	Origin.	Inſertion.	Uſe.
	both muſcles and tendons become amazingly diſtended; but on delivery very ſoon regain their former ſize and extent.		

Muſcles of the Organs of Generation.

Dartos.	This I think ſhould be conſidered as a common muſcle to the ſcrotum, lining its internal ſurface; it is uſually conſidered as a mere cellular membrane, but when its great power of contraction is conſidered, it is more than probable that it has a muſcular ſtructure.		
Cremaſter.	From the poſterior edge of the obliquus internus, the aponeuroſis of the faſcia lata, and the tranſverſalis.	By a fleſhy expanſion around the chord, and over part of the vaginal coat of the teſticle.	To draw the teſticles upwards during violent exertions, that they may not be injured, for which it is particularly fitted being a part of thoſe

Name.	*Origin.*	*Inſertion.*	*Uſe.*
			muſcles already in ſtrong action.
Erectores.	From the poſterior, ſuperior, and internal part of the tuberoſity of the iſchium, deſcending obliquely from behind forward, embracing the two cavernous bodies of the penis.	To the lateral parts of thoſe bodies.	To draw, conſtrict, and raiſe the penis.
Accelleratores.	From the ligament at the poſterior part of the pubis, and the membranous part of the urethra in an oblique direction.	By a tendinous line into the urethra nearly its whole length.	To accelerate and preſs forward the urine and ſemen.

Name.	*Origin.*	*Inſertion.*	*Uſe.*
Triangularis, ſeu tranverſalis.	From the tuberoſity of the iſchium.	Into the accelerators and the urethra.	To aſſiſt the former.

Muſcles of Clitoris.

Firſt pair, ſeu ſphincter vaginæ.	From the lateral parts of ſphincter ani paſſes, covering the corpus cavernoſum of the vaginæ.	Into the lateral parts of the body of clitoris.	Contracts the vaginæ, and compreſſes the clitoris.
Second pair, ſeu erectores clitoridis.	The inner part of the crus of the iſchium.	To the root of the clitoris.	It raiſes the clitoris.

Muſcles of the Anus.

The muſcles of the anus, I have found in the ſubjects I have diſſected, to be two pairs, and a ſingle one; retractores, levatores, and a ſphincter. Bourgelat deſcribes the levatores as a ſmall pair, which they are: but totally overlooks the retractores which are very conſiderable. La Foſſe notices theſe, but makes no mention of the others. The levator pair are ſimilar to the tranſverſus perenei of the human; but ſeem more immediately appropriated to the anus, hence I have ſo termed them.

Name.	*Origin.*	*Inſertion.*	*Uſe.*
Retractor ani.	From the iſchium ſuperiorly, where it forms the acetabulum, and in part from the ſacro iſchiatic ligament, paſſing rather upward and backward.	Into and around the rectum, leaving a line between its inſertion and that of the ſphincter.	To retract and draw in the anus.
Levator ani.	From the lateral muſcles of the tail, and from above, having an aponeuroſis, giving it firmneſs.	Into the bottom of the anus at the outer part, croſſing its fibres.	To elevate the anus.

Name.	*Origin.*	*Inſertion.*	*Uſe.*
* Sphincter ani.	By a ſtrong fleſhy band from around the end of the rectum, having a line of ſeparation between it and the retractors.	Runs into and around the anus, forming an orbicular muſcle.	To cloſe the anus, preventing the conſtant eſcape of the fæces, and the entrance of air, inſects, &c.

Muſcles of Tail.

Theſe muſcles are very intricate and difficult to diſſect, ſo as to render them diſtinct from each other. It appears to me, that the diviſions made both by La Foſſe and Bourgelat, are too numerous, and that there are fewer real muſcles, with more numerous origins; but as Bourgelat in point of appearance, origin, and inſertion, is apparently nearly correct, I ſhall continue to follow him; much muſt yet be done before we can be critically correct in theſe intricate parts; even the labours of Albinus, Douglas, and Winſlow, have received later corrections. I therefore may readily ſtand excuſed either for not relying too much on my own judgment, and making arbitrary diſtinctions; or for falling at times into ſome error. If no perſon communicates his knowledge till he is perfect, in this art at leaſt we ſhall long wait before any inſtruction appears:

Name.	*Origin.*	*Inſertion.*	*Uſe.*
Sacro coccygiens ſuperior.	From the ſuperior part of the ſacrum, where its tranſverſe proceſſes appear, or what are ſimilar to thoſe proceſſes.	By ſhort tendons into all the bones of the tail ſuperiorly.	To elevate the tail.
Sacro coccygiens inferior externus.	From the lateral internal part of the ſacrum.	By ſtrong tendons rather inferiorly into each bone of the tail.	
Sacro coccygiens inferior internus.	By an intermixture of heads in the ſame manner with the preceding.	By tendinous production to the firſt five bones of the tail.	Theſe two muſcles depreſs the tail.

Name.	*Origin.*	*Inſertion.*	*Uſe.*
Lateralis.	By tendons from the ſpinous proceſſes of the laſt two lumbar vertebræ and ſacrum laterally.	By tendons into all the bones of the tail, laterally.	
Obliquus.	By a flat tendon from the ſacroſciatic ligament paſſing obliquely upwards.	To the inferior part of ſacrum and firſt five bones of the tail.	Theſe two muſcles perform the lateral motions of the tail.

Beſides the above, there appears to me, to be another more ſuperior elevator of the tail, the elevator deſcribed is ſituated more laterally. The tendons and fleſhy parts of the muſcles of the tail, all take rather a lateral direction, ſo as to form the tail into a kind of ſquare where the ſkin is removed. The elevators are running on each upper angle, and the depreſſors and oblique, on each lower angle. The lateral muſcles are the ſtrongeſt, and the elevatory muſcles bear no proportion in point of ſtrength to the depreſſing; the latter being infinitely ſtronger, which has given riſe to the practice of nicking, or dividing thoſe muſcles whoſe contraction depreſſes the tail. The lateral muſcles are, I conceive, the ſtrongeſt depreſſors of the tail, when both are in action; when one, the tail is carried to one ſide; and as theſe are placed very near the centre of motion, and the tail is a long body to wield, eſpecially when armed with long hair; ſo it was neceſſary they ſhould be ſtrong to enable the animal to bruſh himſelf and prevent the attack of inſects. Beſides theſe muſcles, thoſe forming the upper angles likewiſe act laterally when only one ſide contracts at a time; was this not the caſe, a nicked horſe could not afterwards carry his tail to either ſide; for the lateral muſcles of the lower angles are uſually divided in the ſections made in this operation, and it is neceſſary they ſhould, as being, as I before mentioned, when in conjoint action, ſtrong depreſſors. It is from a want of anatomical knowledge of the tail, that it is ſo ſeldom ſet right, for if the ſections, particularly thoſe more remote from the tail, are not made of an equal depth and extent laterally; ſome part of the contracting fibres will remain; and the horſe carry a falſe tail. It is evident therefore, that the ſection through the ſkin ſhould embrace rather more than half the circumference of the tail, and that through the muſcles in the firſt ſection, or that near the body rather leſs than half, in the next half, and in the third ſlightly more than half, by which the depreſſor muſcles will be more completely divided.

Muſcles of the Extremities.

Though I propoſe treating of the extremities more particularly under their proper head, when the muſcles in common with every other part will be individually and fully deſcribed: yet that the order of deſcription may not be loſt, and that the reference to parts may always follow their proper diviſion, ſo I ſhall continue the muſcles of the extremities in the mode already purſued, and I hope they will be found accurate; at leaſt, as this deſcription is made without any reference to others, and immediately from the ſubject itſelf, ſo wherever errors appear, they are truly my own. I have formed the nomenclature as near as poſſible, according to that in uſe in the human myology, and according to the ſituation, or uſes of the parts themſelves. Had I been aware of Mr. Coleman's nomenclature I ſhould have adopted it, not only from the reſpect I bear to ſuch an authority, but from my wiſh to ſimplify the ſcience, which is the principal reaſon that I have adopted the human nomenclature whenever it is practicable. I have given Bourgelat's nomenclature in notes; that thoſe that diſſect from him may not loſe the key to his deſcription, I have likewiſe occaſionally mentioned other authorities, with the terms they have deſcribed them by.

Name.	Origin.	Inſertion.	Uſe.
	Muſcles of the Shoulder.		
Trapezius*.	From the 4th, 5th, and 6th ſpinous proceſſes of the dorſal vertebræ, and fleſhy by aponeuroſis from the remainder to the 13th, or 14th, and anteriorly from the cervical ligament.	Tendinous into the middle of the ſpine of the ſcapula.	To elevate and draw the ſcapula backwards.
Rhomboideus major.	Fleſhy from 3d, 4th, 5th, and 6th ſpinous proceſſes of the dorſal ver-	Into the ſame cartilage throughout the whole length.	To elevate the ſcapula, and draw it a little forward.

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* This muſcle is much more extenſive in Mr. Stubb's Deſcription of the Muſcles; I have deſcribed as cutaneous, what he calls trapezius. It forms the triangular of La Foſſe; this trapezius is likewiſe the cutaneous muſcle of Bourgelat.

Name.	Origin.	Inſertion.	Uſe.
	tebræ, immediately under the cartilage of the ſcapula.		
Rhomboideus* minor, ſeu levator ſcapuli.	From the ligamentum colli about the ſecond cervical vertebra, the whole remaining length.	Into the cartilage of the ſcapula, the moſt anterior part a little inwardly.	When the neck is the fixed point it draws the ſcapula forwards.
Pectoralis minus, ſeu depreſſor ſcapuli.	From the lateral part of the ſternum paſſing upwards.	Into the anterior ſuperior part of the ſcapula.	To depreſs the ſcapula.
Triangularis†.	From the 4th and 5th	Above the pectoral, at	To draw the ſcapula

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* Releveu propre.—*Bourgelat.*

† Bourgelat deſcribes no ſuch muſcle, but conſiders it as part of the ſerratus major. I rather think Mr. Coleman does the ſame; but as there appears, in ſome meaſure, a diviſion, particularly in the inſertion, I have called it thus; it is not however very diſtinct, and perhaps will not be thought to merit a particular deſignation.

Name.	*Origin.*	*Inſertion.*	*Uſe.*
	tranſverſe proceſs of the cervical vertebræ.	the anterior ſuperior part of the ſcapula.	forwards.
Sératus anticus*.	By fleſhy digitations from the true ribs, from the 6th and 7th tranſverſe proceſſes of the cervical vertebræ. All this large expanſion uniting anteriorly with the	Is determined towards the ſuperior part of the ſcapula; and is inſerted into its whole ſurface below the great rhomboid by very ſtrong fleſhy and tendinous fibres, and a	Strongly to connect the ſcapula with the cheſt, and draw it downward; or as one part acts alone, to aſſiſt the other muſcles.

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* Grand dentele. It is the tendinous ſuperior expanſion of this muſcle that Monſieur Bourgelat, in his large work, deſcribes as a ligament from the ſhoulder to the cheſt; whereby the ſcapula is confined to the cheſt. The anterior part of this muſcle in his deſcription forms the triangular in mine. It is a moſt extenſive muſcle, and when the ſhoulder is fixed muſt greatly aſſiſt reſpiration. Independant of other cauſes, may not this action of the common muſcles of reſpiration be one of the cauſes of difficulty of breathing upon any violent exertion? Theſe muſcles being then employed in other contractions, the cheſt cannot be elevated, but by its proper muſcles, by which their action becomes increaſed, and they muſt eventually tire.

Name.	*Origin.*	*Inſertion.*	*Uſe.*
	triangular, laterally with the intercoſtals; and more poſteriorly being received into the ſerrated portions of obliquus externus.	part into the laſt cervical vertebræ.	

Muſcles of the Humerus.

Name.	*Origin.*	*Inſertion.*	*Uſe.*
Antea ſpinatus.	From the antea ſpinatus foſſa, paſſing down it bifurcates into two tendons, permitting the tendons of the flexor cubiti to paſs between them.	By its two tendons into the two tuberoſities of the head of the humerus*.	To extend the arm, carrying it forward.

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* In conſequence of this diviſion, La Foſſe has made two muſcles of this.

Name.	*Origin.*	*Inſertion.*	*Uſe.*
Poſtea ſpinatus major.	From the poſtea ſpinatus foſſa, paſſing down becomes tendinous.	Into the lateral external part of the humerus.	To abduct the humerus, and to turn it outward.
Poſtea ſpinatus minor*.	Immediately behind the former at the poſterior part of the ſcapula.	By a tendon into the the upper ſmall tuberoſity of the humerus.	To aſſiſt the former.
Extenſor ligamenti, ſeu capſularis.	When the former muſcles are raiſed there appears a ſmall one ariſing from the coracoid proceſs.	Inſerted over the whole of the capſular ligament.	To draw the ligament out, ſo that it ſhall not be pinched between the bones in action.

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[*] This muſcle is uſually deſcribed as a part of the poſtea ſpinatus major, but it appears to me to merit this diviſion.

Name.	*Origin.*	*Inſertion.*	*Uſe.*
Latiſſimus dorſi.	By aponeuroſis from all the dorſal muſcles almoſt to the ilium; and from the ſpinous proceſſes of the dorſal and lumbar vertebræ, and is intimately connected with the fleſhy pannicle.	Under the ſcapula into the internal tuberoſity of the humerus; ſends off a tendinous expanſion to unite with the faſcia of the muſcles of the radius.	To draw the arm backward, and towards the cheſt.
Muſculus communis, ſeu levator humeri. (*See muſcles of the neck*).	By two portions, the firſt from the tuberoſity of the temporal bone, the ſecond from the tranſverſe proceſſes, of the four anterior cervical vertebræ by ten-	Into the external ſuperior part of the arm, ſending down an aponeurtic expanſion to the inferior part of it.	To elevate the arm, and when that is fixed, it is then a muſcle of the neck and head flexing them; it is therefore likewiſe deſcribed with the

Name.	*Origin.*	*Inſertion.*	*Uſe.*
	dinous portions uniting with the cutaneous muſcle of the neck.		muſcles of the neck.
Subſcapularis.	From below the rhomboid and ſerratus anticus filling the ſubſcapulary hollow collecting its fibres to it.	Terminates ſtrong into the head of the humerus.	It is an adductor to the arm, ſtrengthens the articulation, and prevents the inner part of the capſular ligament from being pinched.
Pectoralis magnus.	From the lateral part of the ſternum, the aponeuroſis of the obliquus externus,and the cartilages of the laſt ſix true ribs.	Into the lateral internal part of the humerus.	To draw the humerus downwards and backwards.

Name.	*Origin.*	*Inſertion.*	*Uſe.*
Sterno brachialis*.	From the anterior part of the ſternum by a thin broad plan of fibres.	Into the internal and inferior part of the humerus, and the ſuperior part of the radius by an expanſion.	To be an adductor to the arm, and when this and the laſt act, making the arm the fixed point, they aſſiſt in reſpiration, for though the ſternum is fixed in its ſituation, yet it can by means of the cartilages of the ribs be brought forward ſo as to enlarge the cheſt.

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* This muſcle forms part of Bourgelat's common, and I believe Mr. Coleman deſcribes it under the name of pectoralis primus or brevis. It is evidently a diſtinct muſcle, and I thought the name I have deſcribed it by, a more definite one than multiplying the pectorals. The pectoralis magnus, I believe, Mr. Coleman calls pectoralis ſecundus, but neither of this or the former am I certain.

Name.	*Origin.*	*Inſertion.*	*Uſe.*
Coraco brachialis.	From coracoid proceſs of the ſcapula.	Into the lower and poſterior part of the humerus.	Draws the arm forward, and turns it outward.
Adductor humeri, ſeu teres major.	From the ſuperior part of the poſterior edge of the ſcapula deſcends along the ſubſcapularis muſcle.	Into the internal part of the humerus.	To draw the humerus upwards and inwards, and, when this part is fixed, the ſcapula downwards.
Adductor longus humeri, ſeu teres minor.	From the poſterior edge of the ſcapula and tendinous faſcia of the poſtea ſpinatus.	External tuberoſity of the humerus.	To draw the humerus upwards and outwards.
Abductor brevis humeri.	From the poſterior edge of the ſcapula below the preceding.	Between the preceding and the ſubſcapularis.	To aſſiſt the former, but more particularly to rotate the arm.

Name.	*Origin.*	*Inſertion.*	*Uſe.*
Muſcles of the fore Arm.			
Flexor radialis anticus*.	Tendinous from the tuberoſity of the ſcapula; above the glenoid cavity, the tendon becomes flattened to paſs over the articulation of the ſcapula and humerus, paſſing between the condyles.	Into the internal tuberoſity of the radius with the obliquus.	This muſcle bends the arm.

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* This is called by Bourgelat long flexor, and is the human biceps, but it has here only one head, and therefore cannot be called biceps, and the name of long flexor is too indefinite. Its tendon, as it paſſes over the articulation, is flattened into a cartilaginous ſurface, and inveſted with a capſular ligament, ſo as to become to this joint a patella in the ſame manner as that bone does to the ſtifle joint.

Name.	*Origin.*	*Inſertion.*	*Uſe.*
Flexor brachialis obliquus.	From nearly all round the neck of the humerus, and is extended obliquely around its body through the extenſor intermedii.	Into the internal tuberoſity of the radius with the preceding.	It aſſiſts the former and rotates the fore arm.
Faſcialis cubiti*.	Aponeurotic from the poſterior edge of the ſcapula, expanding as it proceeds, and is inſerted.	Fleſhy into the olecranon and by faſcia over the muſcles of the fore arm and canon.	By extending the faſcia it aſſiſts in the extenſion of the arm, and binds down the muſcles in action.

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* Long extenſor of Bourgelat, and part of triceps of the human.

Name.	*Origin.*	*Inſertion.*	*Uſe.*
Biceps extenſor cubiti*.	By two portions from the poſterior edge of the ſcapula its whole length.	Into the olecranon.	To extend the arm very ſtrongly.
Brachialis internus.	Below the head of the os humeri internally.	Internal and top part of the olecranon.	An antagoniſt to the oblique flexor.
Extenſor cubiti intermedii†.	From the cervix and ſome part of the body of the humerus extends down the upper and outer edge, leaving an interval for the brachialis obliquus.	Into the proceſs of the olecranon.	Aſſiſts in the extenſion of the arm.

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* This forms two muſcles in Bourgelat called long and ſhort flexor; in the human this and the preceding from a triceps: but I have thought this diviſion more natural.

† Bourgelat divides this into two muſcles.

Name.	*Origin.*	*Inſertion.*	*Uſe.*
Muſcles of Canon.			
Extenſor metacarpi magnum*.	From the external condyle and tuberoſity of the humerus paſſing down tendinous.	Into the anterior tuberoſity of the canon.	To extend the canon.
Extenſor metacarpi radialis†.	From the lateral part of the radius, from its middle downwards, paſſes obliquely over the bone.	Into the ſmall internal metacarpal bone.	Aſſiſts the former and turns out the foot.
Flexor metacarpi externus.	From the poſterior part of the external condyle of the humerus.	Into the piſiformis and continued to the outer ſmall metacarpal bone.	To bend the canon.

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[*] Right anterior extenſor of Bourgelat.

[†] Obliquus extenſor of Bourgelat.

Name.	*Origin.*	*Inſertion.*	*Uſe.*
Flexor metacarpi internus.	From the internal condyle of the humerus.	To the poſterior part of the canon.	To bend the canon.
Flexor carpi.	From the poſterior part of the internal condyle of the humerus paſſes obliquely.	To the piſiform bone.	To bend the carpus, and to prevent the ligament from interfering with the motions, or from being pinched.
Muſcles of the Foot.			
Extenſor longus pedis anticus*.	Fleſhy from the lower and external head of the humerus, and ſuperior part of the radius through an annular ligament.	To the anterior eminence on the coffin bone.	To extend the foot.

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* Extenſor anterior.——*Bourgelat.*

Name.	*Origin.*	*Inſertion.*	*Uſe.*
Extenſor lateralis pedis.	From the outer head of the radius, paſſes through an annular ligament over the knee, and unites with a ligament from the poſterior part.	Into the ſuperior part of the paſtern, and is continued to the coronet and foot.	It aſſiſts the former.
Flexor pedis perforatus anticus.	From the internal condyle of the humerus paſſes behind the knee through an annular ligament, and forms a ſheath for the perforans which	On each ſide of the coronary bone.	To bend the foot and paſtern.

Name.	*Origin.*	*Inſertion.*	*Uſe.*
	at the paſtern becomes a complete ring.		
Flexor pedis perforans anticus.	By four heads; the 1ſt from the poſterior part of the olecranon, the 2d from the poſterior part of the cubitus, the 3d and 4th from the humerus uniting as they proceed into a ſtrong tendon inveſted by the former.	Into the vaulted arch of the coffin bone.	To bend the foot.

Muſcles of the poſterior Extremities.

In theſe as well as the anterior, I ſhall only give their names and general character, reſerving the more particular deſcription to that of the extremities themſelves, at which time we ſhall deſcribe the faſcia that covers the whole of theſe.

Name.	*Origin.*	*Inſertion.*	*Uſe.*
Muſcles of the Thigh.			
Gluteus* poſticus.	By two portions; the anterior from the anterior angle of the ilium, the poſterior from its poſterior angle.	By a flat tendon to the little trochanter, giving off an aponeuroſis.	This muſcle aſſiſts the large glutei.
Tenſor vaginæ femoris ſeu faſcia lata.	From the anterior angle of the ilium running down fleſhy, and expands into an aponeuroſis.	Into a ſimilar aponeurotic expanſion over the thigh.	To ſtretch the membranous faſcia, and prove an abductor.
Semimembranoſus †.	From the tuberoſity of the iſchium and its inferior	Inſerted in part into the anterior of femur and	It is a principal abductor of the thigh.

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* Little Glutei of the human.—*Bourgelat,*

† Part of the longus vaſtus.—*Bourgelat.*

Name.	*Origin.*	*Inſertion.*	*Uſe.*
	angle paſſes down in a fan-like form ending in aponeuroſis.	tibia; poſteriorly into the muſcles of the thigh, leg, and tendo achilles.	
Biceps flexor cruris.	By two heads; the longeſt in common with the next muſcle, the other fronting the tuberoſity of the iſchium.	By a tendon and aponeuroſis to the inner ſide of the ligament and ſpine of the tibia.	It is an adductor to the thigh, but principally a flexor.
Flexor cruris poſticus*.	From the coccygis and tuberoſity of the iſchium.	By aponeuroſis to the internal condyle of the femur, and ſuperior extremity of the tibia.	This bends the thigh in common with the laſt.

* Demimembranoſus.

Name.	*Origin.*	*Inſertion.*	*Uſe.*
Gluteus maximus.	Contiguous to the ſacro lumbar maſs, covers the external ſurface of the ilium and lumbar vertebra, ariſing as well from the ſpinous proceſſes as thoſe of the ſacrum.	By fleſhy and tendinous fibres into the head of the great trochanter.	To extend the thigh, and draw it backward and outward.
Capſularis*.	A ſmall muſcle ariſing from the brim of the acetabulum, paſſing over attached to the capſular ligament.	To the lateral and external part of the femur.	To prevent the capſular ligament being pinched.

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[*] Bourgelat calls this the ſtraight muſcle and a rotator of the thigh; but its real uſe appears to me to be that of preventing the capſular ligament from being pinched or ſtretched.

Name.	*Origin.*	*Inſertion.*	*Uſe.*
Gracilis.	From the pubis and iſchium, having an interſecting line.	By aponeuroſis into the faſcia of the inſide of the thigh, and inſerts itſelf in common with the gracilis into the lateral internal head of the tibia.	To adduct the thigh.
Sartorius*.	From the inner edge of the middle of the brim of the pelvis, croſſes the pſoas and iliac muſcles.	In common with the gracilis into the lateral internal head of the tibia.	Acts with the former.
Pſoas parvus.	See muſcles of loins.		
Pſoas magnus.	Tranſverſe proceſſes of the three laſt dorſal, and	Into the inner trochanter of the femur.	It is a flexor to the thigh.

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* Long adductor.—*Bourgelat.*

Name.	*Origin.*	*Inſertion.*	*Uſe.*
	four firſt lumbar vertebræ and two laſt falſe ribs.		
Iliacus internus. magnus.	From the internal ſurface of the ilium.	Into the trochanter minor.	To aſſiſt the former.
Iliacus internus minor.	From the inferior part of the ſpine of the ilium.	With the preceding.	It aſſiſts the former.
Pectineus.	From the ſymphyſis pubis.	Below the preceding.	To flex the thigh and depreſs the pelvis.
Triceps adductor femoris.	By three heads: one from the internal edge of the pubis; one from the the anterior branch of the iſchium; and a third from its tuberoſity.	By three portions: into the poſterior of the femur; into the ſuperior and internal part of the tibia, and the tuberoſity of the femur.	To draw the thigh inwards.

Name.	*Origin.*	*Inſertion.*	*Uſe.*
Vaſtus externus.	Broad and fleſhy from the root of the great trochanter, and the external lateral parts of the femur.	Into the lateral part of the patella.	
Rectus cruris.	By two tendons, one from the ilium above the acetabulum, the other from the upper part of the femur.	Into the upper part of the patella by a ſtrong tendon.	
Vaſtus internus.	From the cervix of the femur, and the inner tuberoſity, as well as its whole internal ſurface.	Into the inner ſide of the patella.	

Name.	*Origin.*	*Inſertion.*	*Uſe.*
Cruralis.	From the front of the femur in the midſt of the three preceding muſcles.	Into the inner ſide of the patella.	Theſe four laſt muſcles are ſtrong extenſors of the leg.
Obturator externus.	From the inner crus of the iſchium, ſurrounds the foramen thyroideum, and from the ligament of this opening.	Into the cavity at the root of the great trochanter.	To rotate the thigh.
Quadratus femoris*.	From the lower portion of the tuberoſity of the iſchium,	Below the great trochanter.	Acts as the former.
Gemini.	One ſuperior to the other from the iſchium and pubis.	With the preceding.	It proves an antagoniſt to the laſt.

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* This muſcle is not deſcribed by Bourgelat.

Name.	*Origin.*	*Inſertion.*	*Uſe.*
Obturator internus.	Within the pelvis from around the foramen thyroideum, paſſes out of the nitch of the iſchium with the poſterior crural nerve.	With the preceding.	
Pyriformis.	Within the pelvis from the ſacrum, paſſes with the former.	Inſerts itſelf with the above.	Both aſſiſt the gemini.
	Muſcles of the Canon.		
Popliteus*.	From the lateral external condyle, taking an	dle and internal part of	To draw the leg inwards.

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* Abductor.—*Bourgelat.*

Name.	*Origin.*	*Inſertion.*	*Uſe.*
	oblique courſe from above downward, and from outward within.	the tibia.	
Tibialis anticus*.	By two origins, one by a ſtrong tendon from the anteriorexternal condyle of the femur, and by a fleſhy portion which inveſts this tendon. The fleſhy portion ends in a tendon, which is in turn inveſted by the tendon firſt deſcribed.	Both bifurcate and inſert themſelves laterally into the canon on each ſide.	It proves a forcible flexor.

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[*] Flexor of canon.—*Bourgelat.*

Name.	Origin.	Inſertion.	Uſe.
Gaſtrocnemius*.	By two diſtinct portions from the femur above its condyles, which uniting into a fleſhy belly have a tendon from each curiouſly twiſted.	Inſerted into the point of the hock.	A powerful extenſor of the canon.
Plantaris†.	From the ſuperior part of the ſpine of the tibia between the flexor and lateral extenſor of the foot.	By a ſmall tendon into the point of the hock.	To act upon the muſcles themſelves, and to prevent improper combinations in their actions.
Flexor pedis perforatus poſticus.	From the cavity behind the condyles of the	On each ſide of the paſtern.	To bend the paſtern and foot.

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* Gemini.—*Bourgelat.*

† Lateral extenſor.—*Bourgelat.*

Name.	*Origin.*	*Inſertion.*	*Uſe.*
	femur; paſſing down it receives the point of the calcaneum into a ſac inveſting the tendon of the perforans.		
Flexor magnus pedis perforans poſticus.	From the poſterior external part of the head of the tibia, its fleſhy fibres forming into one ſtrong tendon, which is received into the ſheath of the laſt muſcle.	Into the vaulted arch of the coffin bone.	To flex the foot.
Flexor minus pedis perforans poſti-	From the poſterior part of the head of the tibia,	Unites with the preceding and terminates with it.	Aſſiſts the former.

Name.	*Origin.*	*Inſertion.*	*Uſe.*
cus*.	paſſes under the annular ligament.		
Extenſor longus pedis poſticus.	From the tendon of the extenſor of the canon, around which its fibres ſeem to ariſe, as well as from the head of the tibia.	Into the anterior eminence of the coffin bone.	It extends the foot.
Extenſor lateralis pedis†.	By a tendon from the lateral part of the external head of the femur, and from the head of the fibula.	Uniting with the preceding, terminates with it.	To aſſiſt the former.

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[*] Lateral Extenſor.---*Bourgelat.*

[†] Oblique Flexor.---*Bourgelat.*

Name	*Origin.*	*Inſertion.*	*Uſe.*
Extenſor minus.	Is an expanſion of fleſhy fibres from the tendon of the extenſor longus to the extenſor lateralis.		To approximate theſe two tendons.

SECTION XI.

Burſalogy.

This ſubject comprifes a knowledge of thoſe appendages to tendons, whereby the effects of friction are prevented. Tendons are uſually furniſhed with a ſheath or theca, within which a mucous is ſecreted of a glairy, ſlippery nature, by which they are enabled to ſlide within this ſheath with great eaſe. At the extremities of the tendons, particularly in parts more immediately liable to preſſure or friction, theſe are frequent and diſtinct, when they are called *mucous capſules*, or *burſæ mucoſæ*. Dr. Monro has been at the pains to diſſect, and cauſe engravings to be made of all the more particular ones of the human body. A ſimilar undertaking of theſe in the horſe would be very uſeful. Theſe vaginal coats of the tendons appear formed of a denſe cellular membrane, whoſe internal ſurface is very vaſcular, and ſecretes this mucous. From external injury, or other cauſes, this internal ſurface becomes at times inflamed, and if its reſolution is not effected ſpeedily, coagulable lymph is thrown out, which is not always again abſorbed, but remains between the tendons and its ſheath, occaſioning diſtenſion and lameneſs, from the prevention that ariſes to the freedom of motion; therefore, we are at no loſs to account for that ſwelling, hardneſs, and lameneſs, that is uſually ſeen in horſes worked hard, exiſting in the neighbourhood of the flexor tendons or back ſinews. The mucous capſules at the extremities of the tendons, are frequently taking on a diſeaſed increaſe of their contents, and which, by farriers, is called *windgalls*. It appears probable, that this is an effort of the conſtitution to prevent the effects of increaſed preſſure. A ſimilar diſeaſe is ſometimes obſerved in the human, originating from ſtrains, or from preſſure; they are frequent in the wriſts from the firſt; and from the latter, are very common to houſemaids by ſcouring. In horſes, the parts moſt uſually affected, are thoſe of the flexor tendons, of the paſterns before and behind, and of the hock (*ſee Windgalls*). For a detailed account of the *burſæ mucoſæ*, I would refer the ſtudent to Monro's deſcription of them, with plates; and to Fourcroy, *Memoire des Tendons*, from which, as it has been ſeen, that the muſcles of the human and horſe very generally correſpond; ſo it may be readily imagined thoſe of the tendons and mucous capſules do likewiſe.

SECTION XII.

Angiology.

THE body is compoſed of ſolid and fluid parts. The parts in a ſtate of fluidity are ſome of them in motion, others are at reſt; the latter are uſually in circumſcribed cavities; the former are contained within *veſſels*, the knowledge of which is taught by *angiology*. The *veſſels* of the body are divided into *arteries*, *veins*, and *abſorbents*; and except the hair hoofs, and epidermis, there is perhaps no part of the body without them.

Of the Arteries generally.

The *arteries* are canals, whoſe origin is either from the aorta, or pulmonary arteries, which are the only two original arterial trunks in the body. Conſidered generally, they are long membranous canals, which gradually become ſmaller as they proceed from the heart towards the extremities. This change in their ſize ariſes from their conſtant diviſions into branches; hence they cannot be conſidered as true cones: neither can they be called perfect cylinders, except ſuch portion as is immediately between the branches, which probably is perfectly cylindrical. We muſt not judge of the appearance of arteries from what we obſerve when they are injected with wax, or other ſubſtances: for, in this caſe, their powers being not properly adapted to the preſſure they receive, they become variouſly contracted and enlarged. The arteries appear to have three coats, and it is not improbable that the exiſtence of theſe in various proportions, occaſion ſome conſiderable phenomena in health and diſeaſe. Theſe tunics are an external elaſtic, a middle muſcular, and an internal cuticular. The external appears a thick, denſe, cellular membrane, whoſe elaſtic powers are very conſiderable, more particularly ſo in the aorta, near the heart, where it is ſufficient to preſerve the cylindrical form of the artery when empty; but in the other parts this elaſticity is not ſufficient to preponderate againſt the weight of their ſides. By their elaſtic power the arteries are capable of being diſtended ſo as to admit of a larger quantity of fluid than is merely ſufficient to render them cylindrical: by this likewiſe they can adapt themſelves to a ſmaller quantity than is uſual; was it not for this power, a ſmall hæmorrhage muſt prove fatal: hence, therefore, the arteries are always cylindrical, while within the body, unleſs altered by preſſure. This elaſticity remains for a very conſiderable time after death, much longer than the muſcular tone, yet it does not probably remain perfect; for in a dead animal the veſſels are not full, hence the diameter of the veſſels muſt be increaſed. The elaſtic powers appear in different proportions in different horſes, as in different men; from which ariſes ſome phenomena in the different conſtitutions of individuals of each ſpecies, giving ſome a greater diſpoſition to inflammation, being called in them a ſanguineous temperament, and in others the reverſe. The muſcular coat of the arteries is interpoſed between the two others, and appears formed of fibres nearly circular, extending around the artery by ſeveral ſegments joined together. In the large veſſels theſe are very eaſily demonſtrable, but are with difficulty traced in the ſmaller; nevertheleſs, they muſt exiſt, and that proportionally, in a greater degree in the capillaries than in the larger trunks. The muſcular tunic appears to exiſt in greater proportion in the horſe than in the human; and this accounts for the ſtronger diſpoſition to inflammation: and from this cauſe gangrene ſoon ariſes, the proceſs of ulceration is quicker, and granulations more ſpeedily formed. To this cauſe, it is probably owing, that acute inflammations in the horſe run through their ſtages ſo much quicker than ſimilar affections in the human. Inflammation of the lungs frequently terminate in mortification in forty-eight, and ſometimes thirty-ſix hours. From this power it is, that a horſe can bear the diviſion of a much larger artery without danger than a man. Even dividing of the carotids takes a very conſiderable time to produce death, while in the human, it follows almoſt inſtantaneouſly. From the ſtrength of this muſcular coat in the capillaries, when they are ſtimulated, as in the cold fit of ague or fever, the blood is forced into the veins and large veſſels, and hence that rigor or ſenſe of ſhrinking; and in the human, that paleneſs, or tinge of purple the ſkin aſſumes.

The cuticular coat of the arteries is very ſmooth internally, by which the blood is permitted to paſs freely onwards, yet there is in ſome parts little riſings or doublings of the membrane, whoſe immediate uſe is not evident. The general proportion of theſe coats is not only found to vary individually, but generally; that is the proportion of the cavity of an artery to its ſolid ſides is not every where equal, and even varies in different parts of the ſame veſſel. The arteries themſelves are furniſhed with ſmall arterial branches, which ramify on their external coats. It is thought that they have likewiſe nerves ramified on their ſubſtance. Different parts are more or leſs plentifully ſupplied with arteries, according to their nature; ſecreting organs have uſually large trunks, as the kidneys, the brain, and ſpleen. It is likewiſe ſuppoſed, that theſe are variouſly proportioned in various animals; and that different animals have peculiar and appropriate arteries: and this ſeems the more likely, as we find no great variety exiſting in the blood itſelf, between the human and brute, or between one brute and another, as is proved by the operation of transfuſion, in which I have witneſſed that no ill effects ariſes to one animal while the blood of another animal totally different is infuſed into him.

The arteries give off branches as they proceed in every direction; the manner of this diſtribution varies, but in every inſtance diſplays the moſt admirable contrivance: as the reſiſtance is leſs in one ſolid trunk, ſo the capacities of two trunks are always increaſed; that is, that the united ſections of any two branches emanating from a divided artery, always exceed that of the trunk from whence they originated. Their angles are likewiſe various; in ſome inſtances they are more open, as in the intercoſtals and kidneys, whereby the impetus of the blood is prevented from being too great; but more frequently the branches go off at half right angles, or thoſe which are conſiderably acute, which is the moſt favourable to the freedom of the flow of the blood. Their courſe is frequently undulated to retard the blood, or to anſwer ſome other wiſe end; this is particularly the caſe with the ramification of the vertebral, and internal carotid arteries; in the inteſtines, ſpleen, and uterus.

Our knowledge of the termination of theſe veſſels is very confined; we can readily ſee they frequently terminate by anaſtamoſis, or the uniting of one branch into another, whereby the blood has its courſe in ſome meaſure altered; we know, that they terminate in veins, becauſe we can empty the arteries, by drawing the blood from the venal trunks, and becauſe injection forced into the arteries, in many inſtances, enters the veins: they likewiſe terminate on ſecreting ſurfaces, or form exhaling veſſels, whereby the contents of the artery is changed, and the blood having undergone freſh combinations, is poured forth in a new form; one of theſe great changes goes on, and the remainder is returned by appropriate veins. All the ſecretions are carried on by the arteries but the ſecretion of bile, and that is formed from the veins. The ultimate branches of the arteries muſt many of them be of inconceivable fineneſs, ſince they are only capable of admitting a portion of the blood, refuſing the red particles, whoſe minuteneſs is ſuch as to require the beſt glaſſes to detect them: that theſe veſſels do refuſe them admittance we know, by the effects of inflammation, in which parts have red blood, that before had only the more fluid portion; and hence we know, that inflammation increaſes the ſize of the veſſels.

The living power of the arteries muſt be great, for they are capable of extending themſelves through coagulable lymph thrown out, whereby they organize it; this we ſee take place in the callus of bones, and in cicatrices, which in time become vaſcular; but an artery, when divided, will not become pervious, though a vein will. This probably ariſes from the want of an elaſtic coat in the one, and the preſence of it in the other *. The knowledge of the ſituation of arteries is very important, and becomes eſſentially neceſſary to a good ſurgeon, and an acquaintance with their ſtructure and functions, becomes almoſt equally ſo to conſtitute either a good phyſician or ſurgeon. The evident uſe of the arteries is to convey the blood from the heart to different parts of the body, furniſhing nutrition to thoſe parts; and by theſe means keeping up the vital principle in them, and affording them heat, as well as ſerving for the ſecretion of different fluids: hence their office is very important, and an intimate knowledge concerning them forms a very principal branch of phyſiology. Mr. Hunter has taught, that there is a ſtrong affinity, or peculiar connection between the blood and its veſſels; and his opinions on this ſubject have led to conſiderable improvements in our manner of treating diſeaſes in general, and wounds in particular. The fluid ſtate

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* Mr. Charles Bell has endeavoured to ſhew, that when the principal branch of an artery is obliterated, the collateral trunks enlarge to carry the blood; and this enlargement he attempts to prove is not ſimply ariſing from the increaſed diſtention of the blood, but a real enlargement of their trunks, with an acquiſition of ſtrength and thickneſs to their coats. The arteries are in ſome inſtances tortuous in their courſe. Dr. Hunter thought it aroſe from the artery being lengthened, and therefore it could not preſerve its courſe; but Mr. Charles Bell thinks, that it is lengthened by its own living powers, where there is occaſion; becauſe in three inches of artery, he argues, there muſt be more force than in two.

of the blood appears connected with living veſſels; blood parted from them dies and coagulates. The blood likewiſe ſtimulates its veſſels, which is, perhaps, one very principal cauſe of their contraction: this ſtimulus ſhould be in a certain degree; if increaſed, diſeaſe is produced: it is not unlikely likewiſe, that a defect in ſtimulus may produce derangement. As the uſe of the arteries is to convey the blood from the heart, ſo the mode in which this is done is worthy of inveſtigation: we are not perhaps aware of all the phenomena of circulation, but we are aware of a certain ſenſation in the artery, called *pulſation*; and which, from various experiments, is found to ariſe from its being alternately in a ſtate of diſtention and relaxation. The phenomena of circulation have been attempted to be accounted for mechanically, as being a mode beſt adapted to our general ideas; but we muſt never confound the action of living bodies with the laws of dead matter. It has been ſuppoſed, that when the left ventricle contracts, and forces the blood into the arteries, the preſſure of the fluids occaſions a diſtention of their coats, and a conſequent dilatation, which is termed their *diaſtole:* when the left ventricle ceaſes to act, and becomes diſtended, then the impetus againſt the ſides of the veſſel ceaſes, when the muſclar fibres of the artery contract and leſſen its ſize; and this ſtate is called its *relaxation* or *ſyſtole.* The pulſe, properly ſo called, is the ſtate of dilatation of the artery, and ſo many renewed dilatations as the arteries make in a minute, ſo many is the pulſe ſaid to be. But it does not appear probable, that the heart is the ſole propelling power; if that was the fact, the circulation in every part would be exactly proportioned to that of the heart and the reſt of the parts; but this does not appear to be the caſe, for we know that a diſpoſition to contraction in the ſmall veſſels of a part may be increaſed, producing an actual diminution of the veſſels of that part, and conſequently diminiſhing the circulation, and *e contrario.*

The contracting force of the ſmall veſſels of the body generally, or of a part in particular, may be ſo much diminiſhed as to produce an increaſe of circulation; hence there muſt be an exiſting power in the arteries themſelves, and this is probably very conſiderable; and though the mechanical effects of diſtention brought about by the heart's action may influence them, yet it is probable alſo, that the blood is itſelf a ſtimulus by which they are diſpoſed to contract; and again it appears evident, that foreign ſubſtances can act partially, ſo as to induce them to increaſe the circulation in a part, without increaſing it in the whole.

The *common* effects of circulation are thought to be brought about by the *cuticular coat*, but when increaſed beyond the natural ſtandard, then the *muſcular coat* acts. To this opinion it has been objected, that if their contractions and dilatations were dependent on their elaſticity, their ſize in the living and dead ſubject would be the ſame; and that the veins injected with the ſame force that the blood acted with when alive, would continue of a ſimilar ſize with the living veins, which we know is not the caſe *. It may be added, Why is the muſcular coat ſtrongeſt when the cuticular is weakeſt ?

The diſtention of an artery, it appears certain, may be ſo great as to overcome its contracting power, as any elaſtic body may be diſtended beyond its tone or capability of recovery; hence a ſmall pulſe is not always a ſign of debility: for in inflammation of the vital organs, this diſtention of the veſſels frequently takes place to ſuch a degree as to prevent their natural contraction; and a ſmall pulſe is by this means produced: but if the over-diſtending column is removed by copious bleeding, the over-ſtretched muſcular coat recovers its tone, and can contract on its contents; and thus, in ſuch caſes the pulſe is found to riſe on bleeding. The bladder, we know, under long retention of the urine, becomes ſo diſtended as to be incapable of contracting on its contents, and unleſs it is artificially emptied, the muſcular coat will give way and burſt. It is therefore probable, that an inflamed part is not in a ſtate of increaſed ſtrength, though it is of increaſed action; but, on the contrary, that as the veſſels are preternaturally diſtended, they are in conſequence weakened: hence, in local inflamma-

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* Fordyce's Elements, page 70.

tion, or where a part only, is labouring under increaſed action, and has its circulation increaſed; topical bleeding, by emptying the veſſels of the immediate part, is highly uſeful; while, on the contrary, general bleeding may, in the ſame caſe, be prejudicial, becauſe it weakens the ſame veſſels, by weakening the ſyſtem in general, and renders them leſs able to contract. We may, therefore, learn why diminiſhing the general ſtrength frequently augments the inflammation.

From various means we are aware, that the arteries in the living animal are always full; we ſee it by the microſcope, and we are aware that the new column of blood can be but ſmall, in proportion to the contents of the whole arteries, yet it is ſufficient to dilate them, and to cauſe their conſequent contraction. As the velocity of the blood's motion, in ſome meaſure, decreaſes as the diſtance becomes greater from the heart, from the anterior wave, moving ſlower than the poſterior newly received; and as the force of the heart decreaſes, and that of the arteries ſtrengthens, the farther they are removed from it; ſo at laſt the column is preſſed on by one regular force; and in every minute artery divided there is a regular ſtream, with ſcarcely any jet: this, however, only takes place in the minuteſt arteries. We thus ſee why there is no pulſation in the veins, they receiving the blood from the arteries in one equable ſtream, continuing it by the laſt impulſive force of the heart, and the new one of the arteries, now blended into an impreſſive whole. Finally, it appears, that it is one of the moſt important offices in the arteries, and one of the great exertions of their living powers, conſtantly to adapt themſelves to the contained blood; and that the laſt effort of life is to throw off the blood they can no longer act upon: hence, in death, the arteries force the blood into the veins, from which one is found full, and the others empty, or nearly ſo.

Of the Pulſe.

It is therefore ſeen, that the contraction of the heart cauſes a dilatation of the artery, or its *diaſtole*, and the ceſſation of action in the heart, or its diſtention, produces the contraction in the artery, or its *ſyſtole*; and that theſe two cauſes operating alternately, produce the phenomena of circulation.

This momentary increaſe of capacity in the artery whereby its diameter is enlarged, is called its *pulſe*, and the more frequent are theſe dilatations in it, or the leſs numerous, ſo is the pulſe quicker or ſlower. From the regularity of the blood's motions, the pulſe is felt in all parts of the body at the ſame time. Now, as the blood is known to be one of the moſt eſſential of the parts of the body, upon the regularity in the diſtribution of which health in a great meaſure depends; and as there is ſeldom diſeaſe preſent without an alteration in the arterial ſyſtem, either accelerating the motion of the blood, or retarding it, or perhaps, in ſome inſtances as having, or being an immediate effect on the veſſels themſelves; ſo it becomes always a very important matter to aſcertain the ſeveral ſtates in which the veſſels concerned in circulation may be.

It is a little remarkable, that though the horſe's pulſe is very eaſily and conveniently felt from the branch of the internal maxillary that runs over the poſterior jaw, yet, authors who have written, have either omitted it entirely, or have given the moſt vague directions with regard to it. Bartlet recommends feeling it by the leg, by the carotids, and by the heart itſelf. Mr. Clark ſpeaks of it as moſt eaſily felt, at the origin of the temporal artery, at the baſe of the ear: but it is no where ſo conveniently obſerved as at the part I have deſcribed; and when any thing prevents its being felt at the jaw, it may then be found by the metacarpal artery, on either ſide of the paſtern rather poſteriorly: nor have any of theſe authors hardly agreed about the number of the pulſations, ſome reckoning them more, ſome much leſs. The fact is, that the anatomy of the animal has been hitherto nearly unknown to thoſe who have treated on the diſeaſes; therefore, they had not detected this convenient branch of an artery; and as to the mean pulſations in a given time, a want of knowledge of the œconomy of animal life generally, led them to form their aſſertions on a few inſtances. The pulſe is ſlower in all large animals than in ſmall ones; hence the pulſe of a dog is 80 or 90, according to his ſize; the pulſe of the human, as being much larger, is from 65 to 70.—But in the horſe, as a ſtill larger animal, it is from 45 to 55. In young animals, the weakneſs of the ſyſtem, and its irritability is conſiderable, hence they have a much quicker pulſe: the colt has a pulſe from 70 to 80, or even more; the human infant's beats more than 100: this gradually leſſens to the adult period, when it follows nearly the ſtandard we have noticed. As the heart of a large animal has a longer way to ſend its blood, and its reſiſtance is conſequently increaſed, ſo it takes a longer time to accompliſh its contraction; and thus there is not only a difference between the different ſpecies of animals, but between individuals of the ſame ſpecies as they vary in ſize: from which, the ſmaller the horſe, the quicker is the pulſe, ſo much ſo, that there will probably be 10 or 15 pulſes in a minute more in a Shetland poney than in a cart horſe. The action of the heart likewiſe becomes increaſed in proportion to the waſte of the ſyſtem; what it cannot do in ſtrength, it endeavours to make up in velocity or quickneſs, hence the pulſe is quicker towards the evening than in the morning; it is alſo accelerated by a full meal: it is therefore evident, that many circumſtances muſt be taken into conſideration in ſtudying the pulſe; but theſe, we have noticed, form what may be termed natural variations; there are others that are not natural, and yet muſt ever be kept in mind in our conſideration of this ſubject. A particular irritability of the ſyſtem occaſions a quickneſs in the pulſe. Fear likewiſe occaſions an alteration in it; it is uſually much quickened by any thing inducing timidity, for which reaſon great caution is neceſſary not to alarm the animal, or the pulſating veſſel preſents a wrong indication.

In the human there are many very lengthened details of the pulſe, and many different accounts of the ſeveral appearances the pulſe puts on; but our preſent knowledge of the diſeaſes of the horſe, are too confined to allow much to be ſaid on this ſubject; nevertheleſs, as there ſome particular ſtates of the pulſe almoſt always indicating diſeaſe, and as particular diſeaſes uſually have particular ſtates of the pulſe, ſo it becomes neceſſary to be aware of theſe, and which can only be gained by attention and experience. Yet it muſt ever be remembered, the pulſe is ſubject to great varieties, and exhibits very different ſtates, even in the ſame diſeaſe, not only in different ſubjects, but at different periods in the ſame ſubject. Dr. Heberden, a phyſician of great eminence (*Vid. London Med. Tranſ. vol.* ii. *page* 18), carried this idea ſo far in the human, as to publiſh a treatiſe, in which he endeavoured to prove, that the pulſe never preſented any certain indication, and that it was to be very little, if at all, attended to as giving any knowledge of diſeaſe. But though it is liable to great variations, yet it is of very great moment in diſeaſe, and becomes a criterion of very conſiderable certainty in various diſeaſed affections. The pulſe may, as I have ſaid before, be felt by the poſterior jaw, the fore-fingers may be held on the inſide of the jaw, and the thumb on the other, by which the artery is detected and held in its ſituation, and is very juſtly felt by the reſiſtance of the bone underneath; every perſon ought to acuſtom himſelf to the natural ſtate of the pulſe, by frequently feeling different pulſes of healthy horſes, by which means the varieties produced by diſeaſe, will be eaſily detected; for an affected pulſe does not only conſiſt in its quickneſs and ſlowneſs, but alſo in its hardneſs and ſoftneſs: the differences between either of which and health, can only be learned by attention. Care ſhould alſo be taken, that the horſe is not alarmed, as it renders the pulſe hurried and irregular, even for ſome time afterwards. Having taken theſe precautions, we may then conſider the real ſtate in which the pulſe may be in. The pulſe may be *full*, or *ſmall*; it may be *quick*, or *ſlow*; it may be *hard*, or *ſoft*; or it may be *regular*, or *irregular*; and to which varieties we may almoſt refer all the different ſtates of the pulſe. *A full ſtrong pulſe* where the reſiſtence to the preſſure of the fingers is conſiderable, and the diameter of the artery apparently much enlarged, ſhews ſtrong muſcular action in the heart and arteries. It may have a healthy fulneſs, or it may be increaſed to a diſeaſed ſtrength. In health, though it may be full, it will not be preternaturally ſo, nor will its frequency be augmented; but in diſeaſe the fulneſs will be remarkable, and uſually its frequency increaſed. This pulſe is generally preſent in general inflammation, and in inflammations of the cellular membrane, muſcle, ſkin, &c. and other organs not immediately eſſential to life, where any of theſe are affected to ſuch an extent as to affect the conſtitution: but in inflammation of the vital organs, particularly of the contents of the thoraic and abdominal viſcera, this pulſe is not very uſually preſent. In inflammation of the brain, the pulſe is uſually very full and frequent, accompanied with great hardneſs *.

A ſmall pulſe is uſually preſent in all caſes of great debility, and is ſometimes without increaſed frequency, but moſt generally it is accompanied with it. In preſſure of the brain from any cauſe, it is ſmall, and leſs frequent than natural: when it is very ſmall and thread-like, it ſhews extreme debility, and fatal termination of the exiſting diſeaſe: it may, in theſe caſes, be either quicker or ſlower; if with this degree of ſmallneſs it varies in its regularity, or intermits, it is moſt certainly a fatal prognoſtic. We muſt be careful not to be miſled by a ſmall *oppreſſed* pulſe in inflammation of the contents of the cheſt, or abdomen, for it is almoſt a conſtant attendant on theſe affections of the vital organs: if we miſtake this pulſe for true debility, we ſhall fall into a fatal error, it is only a partial debility of the vaſcular ſyſtem from over diſtention, and removes on leſſening the column of the blood: hence, in theſe caſes, the pulſe is found to riſe on bleeding, and ſo long as it does, it is prudent to purſue it.

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* In the human, the inflammation of the brain preſents often great varieties in the pulſe; it is by no means always full, hard, and frequent; and, it is ſaid, that at times it is more tenſe in one arm than the other: but, in the horſe, in all the inſtances I have ever ſeen, the pulſe has been full and frequent. I would here likewiſe caution the practitioner from forming his criterion of the pulſe from the human, for the increaſed muſcular coat in the arteries alters the action of the arterial ſyſtem, even more than the diſproportion between the mere velocity; nor is the ſenſation produced by the two pulſes altogether alike, from the difference of the medium through which they are produced.

A quick pulſe uſually denotes conſiderable irritability in the ſyſtem; we have ſhewn what may be called natural cauſes for the quickneſs of the pulſe, as youth, ſmallneſs of ſize, fatigue, a hearty meal, and a particular temperament: but when none of theſe natural cauſes are preſent, great quickneſs of the pulſe proves the irritability of the vaſcular ſyſtem, and a want of power. But its indication becomes very different as it is accompanied by fulneſs or ſmallneſs. When the frequency of the pulſe is conſiderable, with an increaſe of ſtrength, it ſhews ſtrong inflammatory action, either local or general: if local, it is uſually as we have noticed, of the parts, not immediately eſſential to life: on the contrary, when with a frequent or quick pulſe; for in our preſent knowledge of the ſubject in the horſe, I would avoid making any diſtinction between theſe; there is a ſmallneſs accompanying it, it frequently ſhews a difficulty in the heart and arteries to contract on their contents, which may ariſe from debility of the ſyſtem in general, or only from the debility of the arterial ſyſtem in particular, occaſioned by this over-diſtention we have before noticed, as preſent in inflammation of the vital organs.

A hard or *ſoft pulſe* preſent various indications. In moſt inflammatory ſtates there is a conſiderable degree of hardneſs, and it is commonly accompanying the full frequent pulſe. This hardneſs is likewiſe a frequent attendant, and, I think, one of the great characteriſtic ſigns of inflammation of ſome of the vital organs: in the inteſtines it forms the grand criterion between inflammatory and ſpaſmodic colic: in inflammatory colic we have almoſt always a hard, quick, ſmall pulſe. In ſpaſmodic affection the pulſe is ſeldom hard, and almoſt always full. In inflammation of the lungs, there is not always this hardneſs, but an oppreſſed ſmall pulſe, often not at all quickened: but if the covering of the lungs, or other thoracic membranes are affected, the pulſe has uſually ſome degree of hardneſs, and is quicker, as well as ſmaller. This hardneſs in the pulſe is difficult to deſcribe; but it ſeems a more ſolid ſtroke of the artery, or a ſomething more like a rap againſt the finger, than the full, but equable dilatation of the artery in general; and the ſenſation it gives can only be learned by habit. As this hardneſs is almoſt always a mark of inflammation, ſo a ſoft pulſe exhibited by the arteries yielding to a ſlight preſſure, uſually ſhews a ceſſation of the inflammatory diatheſis; thus, after the hot fit of fever is removed, the pulſe from being hard becomes ſoft: it is likewiſe commonly ſoft at the decline of fever in general: whenever there has been conſiderable local inflammation, and pus forms, it likewiſe becomes ſoft; it is ſometimes a mark of additional debility, where in caſes of great proſtration of ſtrength, the pulſe, though full, becomes very ſoft.

A regular pulſe is ſometimes found under very diſeaſed affections, but it is uſually increaſed in its fulneſs or ſmallneſs, or in its hardneſs or ſoftneſs; a regular pulſe with a proportionate fulneſs is one of the ſtrongeſt marks of health; an irregular pulſe almoſt always ſhews diſeaſe; but it may be occaſioned by organic affection, that is by a peculiar formation of parts, or ſome diſeaſe about the heart, as oſſifications of its valves, or of the larger veſſels.

Irregularity in the pulſe is a mark of great irritability, and if not ariſing from any organic affection, it is a mark of great debility. Inflammation of the heart uſually is accompanied by great irregularity in the pulſe with ſmallneſs; the heart contracts ſeveral times, and then ſtops till more blood is ſent to it. Irregular pulſe in fever ſhews great danger. It uſually accompanies mortification and gangrene, and when inflammation of the lungs terminates in this way, it is uſually preſent.

Theſe may be regarded as the moſt eſſential varieties in the pulſe; but I muſt again remark, that theſe appearances are not conſtant in the ſame caſes, and that no rule can be with certainty laid down; nothing but experience and attention can make any practitioner perfect in this uſeful and neceſſary part of the healing art; but I hope theſe hints may be of uſe to the ſtudent, and prevent him from falling into great error. I muſt likewiſe again repeat what I have ſo often hinted, that the ſcience is ſo much in its infancy, and our knowledge at preſent ſo much confined, that any ſenſible perſon will offer his opinions with diffidence, and adviſe that his rules may be received with caution likewiſe; by which means error will not be propagated, and we ſhall reſpect the intention without ſatirizing the failure.

The Diſtribution of Arteries.

The aorta is the principal veſſel of this ſyſtem, and originates from the left ventricle of the heart, at its anterior and middle part between the vena cava, pulmonary artery, and the trachea, proceeding in one large trunk a ſmall diſtance, it divides into branches, one of which is carried forwards to furniſh the head and extremities, the other proceeds backwards to be diſtributed to the reſt of the body, but furniſhes no incurvation, as in the human.

Theſe diviſions form the anterior and poſterior aortas, the one being ſituated before, and the other behind; but before which diviſion the original trunk has given off a pair of ſmall arteries, immediately at its origin, under the ſemilunar valves, called the coronaries.

The *anterior aorta* is continued ſingle to between the ſecond and third rib, and then divides into two unequal portions, called its right and left branches. *The left diviſion* is conſiderably ſmaller than the other, as it has not to furniſh the carotids; it firſt gives a ſmall branch to the pleura, next what may be called the dorſal, and uſually two others, one between the firſt and ſecond rib, and another between the ſecond and third, which are the anterior and poſterior cervicals, from this paſſing towards the firſt rib, it gives off the left vertebral, and the internal pectoral; and then being continued over the firſt rib, it takes the name of axillary.

The right diviſion of the anterior aorta is nearly twice as large, as well as longer than the left. Its firſt branches of conſequence are one to the pleura; an anterior and poſterior cervical, or what has been called a bronchial; then the internal pectoral, but which is ſometimes, I believe, given off after the carotids, which are the next diviſions of this branch, ariſing by one large trunk. The continuation of this diviſion of the aorta then gains the edge of the firſt rib on the right ſide, and forms the right axillary.

Theſe are the principal branches of the anterior aorta, beſides which there are ſmall rami diſtributed to the thymus, mediaſtinum, pericardium, and trachea; but which in an elementary treatiſe it would be uſeleſs to trace, not only becauſe they can ſeldom influence our practice, which is the true end of anatomical detail; but likewiſe becauſe no deſcription would correſpond with any two ſubjects, theſe leſſer branches, and ſometimes even thoſe we have deſcribed exhibiting conſtant varieties.

Arteriæ coronariæ ariſe from the aorta immediately on its leaving the heart, one on the right, the other on the left ſide, and are diſtributed around the baſe of that organ like a garland, from whence they draw their name. The right ſurrounds the right auricle, and gives branches that run on the ſeptum of the right ventricle to the apex. The left gives branches to the root of the left auricle, and others that paſſing over the contrary ſeptum, anaſtamoſe with the preceding.

The pleural is uſually the firſt branch given off by the anterior aorta, but ſometimes is ariſing from the dorſal, and at others the dorſal itſelf, ſeems a diviſion of this: its ramifications are diſtributed to the pleura.

The dorſal form the next pair, the left ariſing from the left diviſion of the anterior aorta uſually, and the right from the right diviſion, ſometimes from the right cervical. It is now and then only a branch from the preceding; at others there is only a ſmall a ſmall ramus furniſhing the firſt, ſecond, and third intercoſtals; but uſually they are both conſiderable branches, giving ramifications to the pericardium, to the muſcles under the ſcapula, and the neck, and generally furniſhing the firſt two or three intercoſtals.

The cervicals, are two pair on each ſide in ſome inſtances, in others the dorſal and the anterior are one and the ſame; in others, the poſterior and the bronchial are ſimilar and united. The left cervicals uſually ariſe from the left diviſion of the anterior aorta, ſometimes in one trunk, at others in two, paſſing between the firſt and ſecond, and the ſecond and third ribs, and are diſtributed to the cervical ligament, and to the muſcles of the neck and withers: ſometimes the firſt intercoſtal ariſes from one of theſe. The right cervicals ariſe from the right diviſion of the aorta, and ſometimes give the right dorſal, or when that is wanting, the trunks of the three or four firſt intercoſtals: they likewiſe give rami to the œſophagus, mediaſtinum, and ſurrounding parts; frequently likewiſe the right bronchial ariſes from this ſource.

The vertebrals are two important arteries, the right ariſing from the right diviſion of the anterior aorta, after thoſe we have deſcribed; and the left from the left diviſion: they are given off oppoſite the firſt rib, and paſs under the tranſverſe proceſs of the firſt dorſal vertebra, inſinuating themſelves between the ſixth and ſeventh cervical, and are continued up through the foramina at the baſe of the tranſverſe proceſſes of the remaining ſix of theſe vertebræ: it would have been inconvenient from their ſituation to have penetrated the ſeventh. As they paſs, they ſend off ſmall branches through the lateral notches in the vertebræ to the ſpinal marrow, and likewiſe to the muſcles of the neck. From theſe branches being given off, they become very ſmall near the head; where they give a ſmall ramus, uſually paſſing through a foramen in the oblique proceſs of the atlas, to communicate with the external carotid, by which a communication is kept up between theſe veſſels. After they have given this branch each, they make a number of inflections to retard the circulation, unite together, and form the baſillary artery, which runs on the inner ſurface of the cuneiform proceſs of the occipital bone, and are then finally ramified in the cerebellum, firſt giving a branch uniting with a ſimilar one of the carotid to form the circulus arterioſus.

The internal pectoral is uſually the next artery ariſing from the left diviſion; that of the right ſide ſometimes ariſes from the right axillary, after it has furniſhed the carotids. Theſe veſſels, ſoon after they ariſe, give off a branch, which is the *external pectoral*, by authors who follow the analogy with the human too far, called the mammary: but as the mammæ of the horſe are not ſituated here, and it is only diſtributed to the muſcles of the cheſt; ſo it is a very improper term: others have called it, more properly, thoracic. The internal pectoral is then continued along the internal ſurface of the firſt rib, where it gives branches to the pleura, when gaining the ſternum it is continued along its internal ſurface, giving rami to the mediaſtinum, diaphragm, and parts around; and is finally ramified in the muſcles of the cheſt, uſually giving off a branch that anaſtamoſes with the epigaſtric.

The axillary arteries. The left branch of the anterior aorta having furniſhed theſe principal, and other leſſer branches, has its trunk curved about midway over the anterior part of the rib, and inclines in the axilla, paſſing out at right angles with the head of the humerus: but the part where this veſſel receives its name is not among authors definite, being in ſome deſcriptions much within the thorax; in others, as is moſt proper, it gains it only on its curvature. In its paſſage to the glenoid cavity, where it takes the name of humeral, it gives off generally three branches, two of which furniſhing the ſcapula, may be called *ſcapularis inferior*, and *ſcapularis ſuperior*; the third is diſtributed about the articulation of the ſcapula and humerus, and thence called *arteria articularis.*

The humeral artery deſcends along the internal ſurface of the humerus, giving a conſiderable ramus that penetrates the biceps extenſor cubiti, when arrived at the inferior part of that bone near its articulation, it makes a freſh diviſion, giving ſometimes one, at others two conſiderable branches, one of which paſſing between the ulna and radius, may be called ulnar; though ſpeaking with analogy to the human there is no regular ulnar.

The ulnar, if allowed to be ſo called, paſſes poſteriorly between the two bones, and down the lateral external part of the fore-arm, giving the medullary veſſels of both ulna and radius, and rami to the muſcles of this part, anaſtamoſing at the knee with a branch of the radial, and continuing at times in a ſmall branch down the canon.

The radial firſt gives off a branch that paſſes between the condyles of the radius, in company with a vein immediately under the extenſor pedis anticus, and over the extenſor metacarpi radialis, and is diſtributed to the anterior part of the knee. The main trunk is then continued down under the muſcles, behind the radius, penetrates the ligaments, and paſſes within the arch of the piſiform bone; in which paſſage it ſometimes gives a ſmall branch running down the ligament of the canon, and ramifying with its parent trunk and with the ulnaris.

Metacarpal artery. Continuing down and penetrating the ſheath of the flexor tendon, the trunk that was the radial takes this name, and in company with the metacarpal nerve is continued on the inner ſide of this ſheath, gaining the under portion, and deſcending in front of the bifurcating ſuſpenſory ligaments, in which courſe it furniſhes the canon with its medullary branch, and with a ramus anaſtamoſing with the preceding, and ramified on the integuments; having gained the lower part of the canon in company with the metacarpal vein and nerve, it divides juſt above the fetlock into the two.

Paſtern arteries, or *lateral arteries*, each paſſing over the ſeſſamoid bone, behind the vein at the lateral part of the paſtern, tending rather poſteriorly. The nerve which accompanies each is ſituated ſtill more behind, ſo that the artery paſſes between the vein and nerve, which is of importance to remember in ſome operations on theſe parts *. The paſtern artery when it has paſſed over the ſeſſamoids, uſually forms a ſmall branch that goes backward into the poſterior part of the paſtern, and a more conſiderable one that divides and furniſhes the anterior part of the joint: ſometimes there are more than one of theſe anterior branches. When the lateral, or paſtern artery, arrives at the coronet, near the upper point of the cartilage of the foot; it gives off a branch, called the *coronary*, which is paſſing in front, ſurrounding the anterior of this part, plentifully ſupplying its vaſcular ligament, and anaſtámoſing with the oppoſite one: near where the coronary is giving off, ariſes another ramus running backwards and downwards within the edge of the lateral cartilage, and diſtributed throughout the fleſhy frog. Having given theſe branches, the artery itſelf is continued within the cartilages till it arrives at the poſterior part of the coffin bone over its ſurface, rather nearer the lower than the upper part, and is continued two-thirds of its extent over, when it ramifies into it and the ſenſible laminæ. The leſſer branch is continued in a groove in the inferior proceſs, curving over the lower edge of the coffin bone, and ramifies on its under ſurface. The poſterior branch of the main diviſion finds a paſſage within a groove at the convex ſurface of the coffin, behind the line of inſertion of the flexor tendon, being diſtributed both to the ſoft parts and to the bone, which it pierces in every direction, anaſtamoſing by this means with the branches on the anterior ſurface.

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* The ſituation of theſe veſſels ſhould be well underſtood by every practitioner, as in many caſes they may be advantageouſly taken up, that is the paſtern arteries; and, it muſt be evident, the moſt convenient part for this muſt be where they paſs over the ſeſſamoids. A ſection being made through the integuments, near where their pulſation is diſtinguiſhed, they may be encloſed in a ligature, which may prove uſeful in acute inflammations of the feet: perhaps, it is more prudent in theſe caſes, to thus take up one only. The nerve has likewiſe been divided in painful affections and contractions of the feet, but without much benefit: but when attempted, the ſituation of the artery would prove a guide to it.

The other diviſions of theſe arteries ſhould be equally underſtood, as in the operation for quittor, &c. from a want of this knowledge, ſome of theſe trunks might be divided, and very dangerous hæmorrhage enſue.

The right branch of the anterior aorta is conſiderably larger and longer than the left *. The branches ariſing from it we have noticed, but they are by no means always the ſame. *The bronchial arteries* we only named in ſpeaking of the general diviſion of the aorta. Their origin is by no means always the ſame, ſometimes they ariſe as we there mentioned; at others, they are given off from the poſterior aorta, and now and then from one of the intercoſtals. They paſs one on each ſide to the right and left lung, and appear to be diſtributed to ramifications of the bronchia. It is not ſuppoſed that their uſe is to ſupply the ſubſtance of the lungs as has been more generally taught; but that their office is to ſecrete the bronchial mucous. We have already deſcribed the right diviſion of the anterior aorta, as after having given theſe different branches that it furniſhes the trunk of the carotids, and then ends in the axillary. We ſhall now trace the carotids, following nominally one only, as they are both ſimilar in diſtribution.

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* From the peculiarity in the diſtribution of the blood-veſſels of the right ſide of the heart in the human, it has been ſuppoſed was owing, the reaſon that we uſe our right hand in preference to our left: it was conceived that the reſiſtence to the blood was leſs in the united trunks of the right ſubclavian and carotids; and that hence there was a greater quantity of blood ſent to the muſcles of the right arm, by which means they were ſuperiorly nouriſhed and ſtrengthened; and that from this an infant was naturally induced to uſe the right more frequently than the left arm: but diſſections have not altogether eſtabliſhed this theory in thoſe who, by being ambidexter, it would be expected ſome ſpeciality would have been obſerved. The diſtribution of the veſſels of the right ſide in the horſe have ſome ſpeciality; but can this occaſion the preference given to the uſe of the right leg in them; or, indeed, do all colts trot naturally with the right leg firſt?

The carotids ariſe by one common trunk from the right branch of the anterior aorta, and ſoon divide into two portions. Each carotid is a very long veſſel, whereby the ſtrong action of the heart is counteracted, and hence theſe animals are leſs liable to affections of the head than ourſelves, and in whom theſe veſſels are infinitely ſhorter. There are but few branches given by the carotid till it approaches the head, and none of any conſequence. Its firſt rami are the *ſuperior* and *inferior gutteral*, or *thyroideal*, given off near the junction of the firſt and ſecond cervical vertebræ: the grand trunk then divides into what are termed the external and internal carotids; but they receive this deſignation more from the parts they furniſh than from their immediate ſituation.

The internal carotid does not ariſe as in the human exactly, for in him the external gives off ſome conſiderable branches firſt; but in the horſe, the carotid appears more to divide into two at once, without previous branchings. This internal diviſion is very contorted in its courſe before it enters the ſkull, at a large foramen near the junction of the ſphenoid bone with the cuneiform proceſs of the occipital, by which the blood ſent to the brain cannot be too much accelerated, nor can accidental preſſure thus deprive the brain of its ſupport. As it enters the baſe of the ſkull, it gives a branch, that uniting with a ſimilar one from the vertebral, forms the *circulus arterioſus.* It anaſtamoſes likewiſe with the internal carotid of the other ſide, as well as gives branches to the adjacent parts, and finally ramifies throughout the anfractuoſities of the cerebrum and cerebellum. Among its internal ramifications, is one entering the eye, another goes to the palate, ſome rami to the teeth, and ſome to the pituitary membrane.

The external carotid, after giving off the branch to unite with the vertebral, which has been termed the *occipital*, and which I believe is ſometimes given off before the diviſion of the carotid; which branch, as it paſſes up, gives ſeveral rami to the parts around, as the euſtachian cavity; another through the temporal bone furniſhes the crotaphite muſcle, and others penetrate the ſkull. The external carotid after giving this, furniſhes one or two twigs that enter the ſkull, and are ſpent on the dura mater: it likewiſe ſends off two or three other branches, which may be called *internal* and *external auditory*, as being given to the internal and external ear; and likewiſe a branch to the parotid gland, but which is ſometimes furniſhed from the maxillary. After this the principal trunk makes a curve, and paſſes over the os hyoides. It now gives off a conſiderable branch which has been named the *poſterior maxillary*, principally furniſhing the maſſeter muſcle: it likewiſe parts with *the temporal*, which is erroneouſly ſuppoſed to be diſtributed to the eye; and as ſuch, has been recommended to be taken up in inflammations of that organ, but is wholly ſpent on the upper part of the maſſeter muſcle. As this forms a conſiderable error in the practice of ſome very eminent practitioners, the real diſtribution is carefully marked in the plate of ſplanchnology. The trunk then which is called the *internal maxillary*, is continued under the parotid gland, giving a branch to the pharynx, next *the ſublingual*, or *ranine*, to the tongue: ſometimes it gives another ramus or two before the large branch paſſes off to the external part of the face, which we will trace laſt. Having parted with this principal branch, it next gives a conſiderable twig that enters the poſterior maxillary canal in company with a portion of the fifth pair of nerves, where furniſhing the teeth with their blood, it comes out by the foramen at the ſymphyſis of the chin, and loſes itſelf in the muſcles of that part. The remaining trunk then paſſes through the ſphenoid bone, along the junction of the palatine with the maxillary bones, forming the *palatine artery*, and which gives ſome rami to the brain and parts adjacent.

The external branch of the internal maxillary might with propriety be called poſterior facial, and is a very important veſſel, not only from its magnitude, but from its forming the moſt convenient part for feeling the pulſe of the horſe. (*This veſſel, with its exact ſituation, is ſhewn in the plate of Splanchnology, where it is the middle veſſel of the three, as it comes from the under edge of the jaw, and then is croſſing the parotid duct, paſſing upwards towards the eye.*) It paſſes over the poſterior jaw exactly where the tuberous part ends, and near the inferior part of the poſterior attachment of the maſſeter muſcle, about midway between the mouth and throat; paſſing up, it has uſually three principal diviſions, which are evident in the plate: the firſt of theſe is generally given to the maſſeter, anaſtamoſing with the temporal: the next may be called the *naſal*, which furniſhes the ſuperior and external parts of the noſe, as well as giving ſome branches that communicate with thoſe given to the internal parts of the noſe from the palatine. It likewiſe gives a ramus that runs up to the angle of the eye, communicating with ſome branches from the inſide of the ſkull. This artery is from this courſe called *angular*, and is the proper branch to divide in inflammations of the eye, and not the temporal, as the ramifications of the angular are particularly diſtributed to the coats of that organ; whereas the temporal, as we have ſhewn, is given wholly to the maſſeter muſcle. Some authors, particularly Mr. Stubbs, have called the whole of this external branch the angular artery, but, it is evident, very improperly.

The third diviſion of the poſterior facial, or external branch of the internal maxillary, is the *labial*, which is the moſt inferior of the three, and paſſes down furniſhing the muſcles and parts below.

The Poſterior Aorta.

The poſterior aorta is continued from the diviſion of the great trunk poſteriorly, (*ſee Plate of Splanchnology; but where there is too great a mark of incurvation,*) inclining to the left ſide of the vertebræ, nearly as far as the ſacrum.

Ductus arterioſus. The aorta, where it paſſes poſteriorly, having a ſlight curve over the pulmonary artery, (*ſee Plate* IV.) has a canal, by which in the fœtus it communicates with that artery, but which in the adult is ſhrunk and cloſed, appearing only a ſlight ligamentous connection between them.

Intercoſtals. The firſt three or four of theſe veſſels are furniſhed from other ſources, the remainder ariſe from the poſterior aorta, from each ſide poſteriorly, as far as the diaphragm. They are continued on the inner ſurface of the intercoſtal muſcles, at the poſterior edge of each rib, nearly as far as the ſternum, furniſhing the intercoſtal muſcles in their courſe. It is evident from this diſtribution, that in any operation on the ribs, we ſhould be cautious to avoid cutting on their poſterior edge: we may likewiſe hence learn what miſchief may be occaſioned by a fractured rib, as one or more of theſe veſſels may then be ruptured, and the contents diffuſed within the cheſt. Uſually before the intercoſtals take their courſe along the ribs, they give each a branch to the ſpinal marrow, between the tranſverſe proceſſes of the vertebræ. It likewiſe may be remarked, theſe veſſels go off at right angles from the aorta, by which the blood in them cannot have too great an impetus.

The phrenics are two arteries given off to the diaphragm, as the aorta paſſes the crura of this muſcle.

The ſplenic. This veſſel forms a great variety in the horſe from the human. In man, the ſplenic is a branch of a conſiderable trunk, which furniſhes this as well as the coronary, the hepatic, and the gaſtric, and is itſelf called the *cæliac*; but correſponding to which there is no ſuch artery in the horſe: in this animal the ſplenic ariſes from the aorta, and beſides furniſhing the viſcus, from whence it draws its name, it gives ſome branches to the ſtomach; the blood of which is likewiſe returned by the ſplenic vein; but it does not furniſh the pancreatic, this ariſing by a diſtinct trunk.

Gaſtrics right and left, ariſe generally by one trunk, which ſoon divide into theſe two. *The right gaſtric* paſſes along the great curvature of the ſtomach, diſtributing its branches over it, and which anaſtamoſe with the coronary. *The left* *gaſtric* is diſtributed to the other parts of the ſtomach *.

The pancreatic is in the horſe generally a diſtinct branch, furniſhing the hepatic to the liver, and the coronary which ſupplies the duodenum, and the pyloric extremity of the ſtomach.

The hepatic artery, derived from the pancreatic, uſually is ſo ſmall, that it is evident it can only furniſh the liver with ſupport, but not with blood for its ſecreting offices.

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* As the ſtomach of the human ſubject receives a large portion of its blood from the ſplenic artery, and the ſituation of this veſſel is ſuch, that when the ſtomach is diſtended it receives more blood than at other times; ſo this ſpeciality has given riſe to ſome ingenious and novel ideas on the ſubject of digeſtion (ſee ſtomach and its functions): but it is apparent, that however more blood may be determined to the ſtomach under digeſtion than at other times in the horſe, it cannot draw it from this ſource. Does this offer any objection to this theory in general, or are we to look upon the horſe as an exception, and account for his digeſtive powers on ſome other principle?

It has been ſeen, nevertheleſs, that the ſtomach is at all times very plentifully ſupplied with blood. It is a wiſe proviſion, that the ſtomach is not ſupplied from one immediate branch emanating at once from the aorta; for it would then in the different ſituations of the ſtomach have been ſubject to preſſure, either when full or empty. One veſſel might likewiſe have been open to diſcaſed affections, which would have certainly proved fatal. Not only would one trunk have been ſubject to preſſure in animals of quick motion, but the impetus of the blood would have been too conſiderable: but by being ſurrounded by trunks diſtributed to every part, it is furniſhed in every direction, and under every ſituation.

The anterior and *poſterior meſenterics* are two conſiderable branches given off from the aorta at ſome little diſtance from each other. The former is diſtributed to the meſentery, ſmall inteſtines, and a ſmall branch to the pancreas.

The poſterior is likewiſe a conſiderable trunk, much larger even proportionally than that of the human, and furniſhes the large inteſtines and meſocolon. Theſe two arteries anaſtamoſe freely with each other by a particular branch, and are ſurrounding the inteſtines by arches and areolæ, forming a net work of veſſels *. (*Vid. k, Plate* IV.)

The emulgents, or *renal arteries*, are very conſiderable trunks one from each ſide of the aorta. The right is conſiderably longer than the left, on account of the ſituation of the aorta, and its inclination to the left ſide of the vertebræ (*Vid. Plate* IV.), where theſe veſſels are diſplayed. It is likewiſe uſually more anterior than the left, from the kidney of this latter ſide being preſſed poſteriorly by the ſpleen. They go off nearly at right angles with the aorta, by which the circulation is retarded, and the ſecretion better performed from it. Theſe arteries are very large, and it is ſuppoſed that they carry nearly a ſixth of the whole blood of the aorta. They run almoſt in a direct line to the kidneys, and divide in the depreſſions of thoſe glands into ſeveral branches, which are principally ramified into the arterial part. *The capſular* are two ſmall arteries uſually ariſing from the emulgents anteriorly, and diſtributed through the renal capſules.

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* In the meſenteric artery there have been found worms, this appears very frequent in aſſes: they probably ariſe from the inteſtines: it does not appear probable they ſhould ever go higher than the origin of this veſſel, as the impetus of the blood would form an unſurmountable reſiſtance to their progreſs.

The ſpermatic are two ſmall arteries given off from the aorta ſoon after the emulgents uniting with the ſpermatic veins by cellular tiſſue, and continued down to the abdominal ring, or the opening correſponding to the part ſo called in the human, croſſing the ureters in their paſſage, and having joined the vaſſa deferentia, the whole being included into one rope by means of cellular membrane, which is called the ſpermatic cord: they are finally diſtributed to the teſticle. Thus the diviſion of theſe arteries as effectually caſtrates, as removing the teſticles themſelves.

In mares theſe veſſels ariſe in the ſame manner, but are not paſſing out of the abdomen; but are diſtributed to the ovaria and fallopian tubes.

Lumbar arteries are uſually five or ſix ſmall pairs ariſing from the ſuperior part of the aorta, ſimilar to the intercoſtals, and are diſtributed to the ſpinal canal and lumbar muſcles.

Iliac arteries. When the aorta has arrived to about the fifth lumbar vertebra, it divides into the two external iliacs, or rather gives them off; and in about three quarters of an inch, in a moderate ſized horſe, it divides finally into two larger diviſions, called the internal iliacs *.

Internal iliacs are ſo called, becauſe they are continued more inwardly towards the pelvis, and becauſe they are principally diſtributed to the parts within it.

The umbilicals are uſually the firſt branches from them ; ſometimes theſe ariſe where the diviſion of the aorta commences. In the fœtus they paſs under the urethra, and gain the lateral parts of the bladder, to which they give ſome rami ; and then are loſt in the adult, though the remains are continued with the urachus. In the fœtus they are on the contrary, continued up to the umbilicus, or navel, and carry blood between the placenta and the foal. In ſome inſtances they are quite obliterated after birth, and only a ligamentous rope is left ; in others they continue pervious to the bladder as we have deſcribed. After this the internal iliac divides into ſeveral branches, but whoſe numbers and diſtribution are by no means always the ſame : ſometimes the firſt of theſe diviſions is a branch correſponding in office to the human iliaca minor ; at others this paſſes off afterwards, or is only a branch of ſome other artery.

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* This mode of origin of the iliacs is not ſimilar to thoſe of the human, whoſe aorta forms only one diviſion into two branches, each of which is a common trunk to the external and internal iliacs.

Internal pudendal is often the next diviſion of the internal iliac, paſſing between the bladder and rectum, and is principally diſtributed to the parts of generation.

Sacral arteries are uſually, but not always the next, and are two or three ſmall twigs; ſometimes ariſing from one of the principal diviſions, and entering the ſacral holes, furniſhing the nerves and membranes of that bone, and to the tail.

Gluteal arteries are the next pair frequently, and are carried along the internal part of the pelvis in company with the ſciatic nerve, giving branches to all the parts around, and finally ramified in the glutei muſcles.

Obturatrix, or *iſchiatic*, forms the next. The pair paſs one out of each foramen thyroideum, and are furniſhing a branch to the corpora cavernoſa in the male, and clitoris in the female; and are finally ramified in the articulations of the thigh bones with the pelvis.

The external iliacs paſs more externally, and likewiſe furniſh parts without the pelvis. They proceed one on each ſide down the iliac muſcles towards the Fallopian ligament, in which courſe it gives off

A branch to the pſoas and abdominal muſcles; the next uſually are the

Epigaſtrics, which are given off within the pelvis, running obliquely upon the tendon of the tranſverſalis, paſſing forward on the abdominal muſcles, and then ramifying with the internal pectoral.

Arteriæ profunda are giving off ſometimes within and ſometimes without the abdomen, ſometimes the epigaſtrics ariſe from them. Each is a conſiderable branch, whoſe ſituation in the human is momentous in operations on the thigh. It runs down on the inſide of this part, and is diſtributed to the muſcles about the upper part of the extremity.

External pudendals go out by the crural arch, communicate with the internal pudendals, and are diſtributed to all the external parts of generation, giving branches to the inguineal glands, then carried along the penis, and finally ramified throughout the glans. This artery in the mare is furniſhing the mammæ, or bag.

Crural arteries. The external iliacs, paſſing out of the abdomen at the crural arch formed by Fallopius's ligament, receive here the name of crural, accompanying the pſoas muſcles out of the abdomen. Each crural artery deſcending along the lateral internal part of the femur, paſſes for ſome way in company with the crural veins between the pectineus and ſartorius muſcles, to about the middle of the femur, where paſſing obliquely, it gains the poſterior part of the thigh, and is continued down behind that bone. In its courſe, as we have mentioned, it ſometimes furniſhes the profunda, which is diſtributed to the muſcles of the inner ſide of the thigh, that this grand trunk might not be weakened by too numerous diviſions. It uſually gives ſome ſmall branches to the neighbouring parts, one of which is given off ſoon after its origin, and which may be called *circumflexa*; as it turns backwards to furniſh the joint of the acetabulum, and ſome of the muſcles cloſe to the bone, as well as the bone itſelf; it likewiſe gives other ſmall branches. Continuing its courſe in the ham, between the poſterior condyle of the femur in company with the vein, it changes its name to the

*Popliteal**, which is this continuation of the crural artery, firſt furniſhing a large ramus ſent to the articulation of the femur with the tibia, and which is called *articularis:* the main trunk ſoon divides into two principal diviſions. *The poſterior tibial* is one of theſe diviſions, which is continued down the poſterior internal part of the tibia, giving the medullary artery in its paſſage under the flexor minus pedis accompanying the vein, and likewiſe joining the nerve in its courſe, through a groove formed by the calcaneum (*Vid.* IV. *fig.* 1. *Plate of the poſterior Extremities*): it paſſes in this groove in company with the perforating tendon of the flexor pedis muſcle. It here gives ſeveral branches, the principal of which furniſh the hock anaſtamoſing by all its rami, but by one more particularly with the anterior tibial: one branch is continued down on the inner ſide of the internal metacarpal bone, in its paſſage giving the medullary artery to the canon. In this paſſage it may be called the *internal metacarpal*, and which is finally ramified into the integuments and parts at the poſterior of the canon and paſtern, anaſtamoſing freely with the next.

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* The popliteal artery is not liable to aneuriſm as in the human.

Anterior tibial. The anterior tibial forms the other diviſion of the popliteal, and paſſes from between the condyles of the femur obliquely to the external ſuperior part of the tibia, paſſing between it and the fibula, in company with the vein (*Vid.* 15. *fig.* 2.), where the artery is ſeen running down under the extenſor longus pedis, and again becomes evident between its tendon and that of the lateral extenſor, paſſing with them under the annular ligament, giving a branch to furniſh theſe parts, and another that paſſes backwards to anaſtamoſe with the poſterior tibial. It here changes its name to the

External metacarpal artery. This forms the continuation of the anterior tibial paſſing from under the ligaments of the hock, it is continued down obliquely over the front of the canon, towards the outer ſmall metacarpal bone (*Vid.* 3. *fig.* 2.), which having reached, it penetrates between it and the canon, and is continued on its inner ſide under the flexor tendons, in its paſſage anaſtamoſing with the internal metacarpal frequently by a direct croſs branch behind the bifurcating ligament: accompanying the nerve and vein it gains the ſuperior part of the ſeſſamoid bones, when it bifurcates into the two *lateral* or *paſtern arteries*, in the ſame manner as in the fore extremities; being accompanied in its diviſion in the like manner by the veins and nerves. Quere, As this artery paſſes the metacarpal bone, between it and the canon; and as theſe metacarpal bones unite by bony union to the canon, may not the artery become affected in this caſe, or is its own action ſufficient to defend it from the preſſure? *The paſtern arteries* follow exactly the ſame diſtribution as in the fore feet, we ſhall not, therefore, follow them farther, but refer to thoſe.

The Pulmonary Veſſels.

The paſſage of the blood through theſe veſſels is termed the *minor circulation*, and is effected by the pulmonary artery and veins. The pulmonary artery is a trunk of five or ſix inches in length, going out from the right, or anterior ventricle of the heart, continued upon the ſide of the aorta to its diviſion, where it is connected with that artery by means of the membranous canal we have deſcribed, called *ductus arterioſus*; immediately after which it divides into the right and left branches, whoſe length is nearly equal, but the ſize of the left is more conſiderable than that of the right. Each of theſe branches is divided upon their entering the lungs into others, which ramify throughout the ſubſtance in every direction. From the minute diſtributions of the artery, the blood is received by the ramifications of the pulmonary veins, when the venal recipient branches encreaſing gradually, unite in eight principal trunks, which all terminate in the left auricle of the heart *.

The Veins generally.

The veins are veſſels correſponding with the arteries in their common office of carrying the blood, but with this difference, that the arteries are diſtributing their blood from the heart to every part of the body, and conſequently diminiſh in their diameter as they advance; whereas the veins bring back the blood from the parts the arteries had carried it to, and reſtore it to the heart; gradually enlarging in their diameter as they advance. They may, therefore, be conſidered as long membranous canals ariſing in every part of the body, and terminating in the heart. Their fabric is much more ſlender than that of an artery, never preſerving their cylindrical figure when empty: nevertheleſs, they have conſiderable ſtrength, and though their coat may become diſtended, yet they very ſeldom burſt. They are compoſed of two principal tunics, one of which is cuticular, and the other muſt be either muſcular or elaſtic *. In the larger and medium trunks the capacities of the veins is more conſiderable than that of the arteries; they are likewiſe more numerous. They uſually accompany the arteries in their courſe lying along-ſide of their trunks; but as they are ſubject to preſſure from muſcular action, and their coats are not ſtrong like the arteries to reſiſt it; and as the ſtoppage of the blood would be attended with the greateſt inconvenience, ſo there is a ſuperficial order which has no correſpondent arteries: but this ſet is not ſo numerous as in the human. They are, however, conſiderable in the extremities, which are much ſubject to muſcular action.

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* In the human there are only ſix original veins, the two cavas, and the four pulmonary. In the horſe, on the contrary, there are ten original veins, which are the two cavas, and the eight pulmonary. It is remarkable, that neither Bourgelat, La Foſſe, or Vitet, notice this peculiarity in the animal from the human.

The veins having leſs ſolidity in their coat, are provided with valves: a valve appears a duplicature of their inner coat, riſing into a kind of curtain or fold, of which in the human valves there are two, but in the horſe three: they are ſo formed, that the blood paſſing forward keeps the veſſel continually open; but when, by preſſure, the blood is ſtopped in its courſe, the valve is preſſed backward, and by that means expands, and prevents the return of the blood. Theſe valves are not diſtributed equally

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* Veins are by many anatomiſts ſuppoſed to have three coats, while ſome deſcribe only muſcular and elaſtic; others deny the exiſtence of either of theſe: but they muſt have either a muſcular or elaſtic, from their capacity of adapting themſelves to their contents.

throughout the venous trunks, but are much more univerſally placed in the horſe than the human: in ſome they are rather more numerous, in others are entirely wanting, as in the foot, where the arterial force is ſufficient. They are exiſting in moſt of the cutaneous veins, and in moſt of thoſe of the extremities, except the parts we have mentioned; but there are but few in the viſcera, nor are there any where the circulation is neceſſarily ſlower, as in glands. The blood is returned to the heart by a regular flow, at leaſt no pulſation has ever been ſatisfactorily detected; nor have they, that we know of, any contracting power.

Of particular Veins.

The original trunks in the horſe are ten; which are the *anterior* and *poſterior cavas, and eight pulmonary*: to which may be added, the *venæ portæ*. We ſhall firſt conſider the two cavas.

There are two modes of deſcribing the veins, beginning either by their extremities, and following the courſe of the blood, tracing their gradual augmentation, and final termination into the right auricle of the heart: or by beginning at the heart, and proceeding to the extremities. The former appears the moſt correct, and has been followed by ſome of the moſt eminent anatomiſts; but as it is to be conſidered that the arteries by having been already deſcribed in their proper courſe, give a conſiderable key to the knowledge of the veins, which in moſt caſes accompany them, which if this deſcription was reverſed, would be in a great meaſure loſt; and as it is to be likewiſe conſidered, that every impediment ſhould be removed to acquiring the knowledge of the anatomy of the animal in queſtion; and that it ſhould be facilitated as much as poſſible, as its ſtudy will probably fall at firſt to thoſe who have not either much leiſure or patience for inveſtigation: farther, as in deſcribing the courſe either way, the knowledge of their ſituation, which is the grand object, is equally attained, I ſhall chuſe the ſimpleſt method, not regarding the courſe of the blood, but merely conſidering the veins as trunks ariſing from the heart, and diſtributed as the arteries into all parts of the body.

The real origin of the *cava*, by comparative anatomiſts, has not been deſcribed ſufficiently: it is ſpoken of, as though ariſing by one trunk, and dividing, whereas it goes out of the heart by two trunks, from ſeparate parts of the right auricle oppoſite to each other. (*Though their immediate origin cannot be ſeen in the plate, it can be readily diſcovered they ariſe in this manner.*) The one going from the anterior portion of the auricle, forms the anterior cava; the other from the poſterior part, forms the poſterior cava. The anterior chiefly furniſhes the cheſt, fore-legs, and head. The poſterior is principally diſtributed to the belly, and hinder extremities.

The *anterior cava* ariſes from the anterior and ſuperior portion of the right auricle; as it paſſes forward, it inclines a little ſuperiorly, and along the left ſide of the aorta, penetrating the pericardium. Oppoſite to the firſt rib it divides into four principal trunks, two of which (the axillary) go off at right angles, and two at half right lines with itſelf, which are the jugulars. The axillaries, the firſt diviſion of the aorta, are two principal trunks paſſing over the firſt rib.

But before theſe general diſtributions of the anterior cava, it gives ſome ſmaller branches which receive blood from parts correſponding with the branches given off by the aorta in its paſſage. The principal of theſe is the *vena azygos*, which is carried on on the right ſide of the dorſal vertebra, and is receiving the blood from all the poſterior intercoſtals on each ſide.

The vertebrals are given off oppoſite to the ſecond rib; ſometimes the left vertebral is given off from the cervical. Theſe conſiderable veins are gaining the paſſage at the baſe of the tranſverſe proceſſes of the cervical vertebræ, and paſs up, giving branches between the vertebræ in the ſame manner as the arteries whoſe blood they receive, and are anaſtamoſing with the jugular; and finally receiving the blood of the vertebral ramifications are returning it to the cava. The reſt of the branches are the ſuperior intercoſtal, the dorſal, mediaſtina, diaphragmatica ſuperior ſometimes, and pectoralis interna, whoſe mode of origin frequently varies. This branch of the cava then divides, as we have mentioned, into the two axillaries and the two jugulars.

The axillaries. The firſt general diviſion of the anterior cava, are two principal trunks paſſing over the firſt rib. In the human they are called ſubclavian, becauſe they paſs under the clavicle; but as there is no ſuch bone in the horſe, they are called, on account of their ſituation, axillaries; though Vitet has very erroneouſly named them *ſous claviere*; nor have theſe veins the ſame unequal length as the human ſubclavians, as the ſituation of the cava at their diviſion is not ſo far to the right; yet ſtill the left is rather the longeſt. Paſſing before the axillary artery it gains the humerus, giving in its paſſage the *external pectoral*, and ſome other branches correſponding and receiving the blood of the branches of the axillary artery: having gained the articulation of the ſhoulder with the humerus, it takes the name of humeral.

The humeral pours its blood into the axillary, ſometimes in one, at others in ſeveral trunks: when it ariſes from the axillary in one, it ſoon after divides into ſeveral branches, which are diſtributed to different parts of the upper portion of the extremity, which diſtribution is beſt learned from a reference to the plate. The principal branch deſcends towards the poſterior part of the radius, where it takes the name of radial, in company with the artery, firſt giving a branch to the poſterior part of the knee, called the *ulnar*, and ſometimes a deep ſeated one in front; then paſſing down all the way with the artery, anaſtamoſing freely in its courſe with the cephalic, or external vein, it is continued down in company with the metacarpal artery, and receives the name of *internal metacarpal*, as the united trunks of the other branch and cephalic do that of external *metacarpal*. The external and internal metacarpal veins uſually unite to form the *external* and *internal plantar* or *paſtern*.

Beſides theſe diviſions of the deeper ſeated veſſels, there is a ſuperficial order ſituated on the ſurface of the extremity. The *ſuperficial ſet* are ariſing from the jugular, uſually in one trunk, ſoon after its origin, run out under the axillary gland, and paſs from the cheſt downwards, towards the point of the ſhoulder, croſſing the muſcle of the arm, or rather running down the biceps muſcle; here it uſually gives a branch to run ſuperficially, directly in front of the arm; the principal branch is then continued inwardly towards the inſide of the arm, forming what is termed the *cephalic*, or *plate vein* (*Vid. n*, *fig.* 2. *plate* VII). It is this vein farriers uſually open in drawing blood from the ſhoulder or arm. It here receives a branch from the humeral, ſoon after which, it in ſome inſtances, divides into two rami; in others, it is continued down in one united trunk on the inner ſide of the radius, but ſuperficially: near the bottom it frequently, likewiſe, divides into two, which ſurround the inner ſide of the knee, but unite again below it, and paſs down on the outer ſide of the ligament, receiving branches from the integuments, and anaſtamoſing with the deeper ſeated trunk: when arrived at the bottom of the canon, it unites with the internal metacarpal, when the united trunks bifurcate to form the *external and internal plantar*, or *paſtern*, as has been before deſcribed.

The jugulars being part of the principal diviſions of the anterior aorta, as we have ſaid, run up on each ſide the trachea; in their paſſage they give a conſiderable branch ſoon after their bifurcation, which is the cephalic, or plate vein, of the farriers, as we have deſcribed. Having given theſe branches, and furniſhing the parts in their paſſage with ſmall branches receiving their blood, of which the principal is the *thyroid*, as they approach the head they become deeper, and are nearer the carotids, when they arrive oppoſite the angle and tuberoſity of the lower jaw, about three or four inches from it, they bifurcate into two grand diviſions, within which bifurcation lies one portion of the parotid glands. The lower branch may be called the inferior diviſion of the jugular, and the upper branch the ſuperior diviſion. It muſt be remembered, that the jugulars, and the diſtribution of the blood to the head the horſe and man are different; in the former there is no internal jugular properly ſo called; but the vein performing the office of the internal jugular is a branch of the ſuperior diviſion.

The inferior diviſion of the jugular (ſee Plate IV.*)* correſponds to the anterior external jugular of the human, and is called the internal maxillary, paſſing inwards it gives ſome ſmall branches to the larynx and tongue, and then paſſes over the jaw to the outſide, running up the anterior edge of the maſſeter muſcle *(ſee Plate)*, it is giving a branch to the lips over the molar muſcles, and another to enter a foramen in the lower jaw that extends to the chin, into which this branch enters, with a branch of the fifth pair of nerves, and an artery, to furniſh in their paſſage the teeth of this jaw. Paſſing up it makes uſually three principal diviſions, at other times more, and ſometimes leſs: nor are the diſtributions of the branches always alike; indeed they differ in almoſt every ſubject, but the main trunks are uſually ſimilar, and the end in the ſmaller is ever obſerved to be the ſame, however brought about.

The firſt branch penetrates the attachment of the maſſeter to the ſpine of the maxillary bone, and running under this ſpine, gives a branch that forms the palatine vein, then penetrates the orbit under the zygomatic proceſs, dividing into ſeveral ramifications. *The ſecond diviſion*, which is the poſterior of the upper bifurcation, *(ſee Plate* IV.*)* paſſes inwards under the ſpine, to meet the temporal vein with which it ramifies, and gives a branch to form the *angular vein*, and likewiſe a ramus ſometimes that enters the ſkull. *The other and moſt anterior* of this ſuperior bifurcation gives its ramification down to the noſe. As this branch of the jugular comes under the jaw to the outſide, it changes its name, and is properly *the external maxillary* accompanying the maxillary artery. All the veins of the jaw are large, that maſtication might not be impeded, and they all anaſtamoſe freely with each other for the ſame reaſon.

The *ſuperior diviſion of the jugular* paſſes up between the lobuli of the parotid gland, and through it, furniſhing it with ramifications; and in this courſe forms diviſions, which are not always alike, being ſometimes more and ſometimes leſs; there, however, uſually appear three greater trunks, and one or two leſs. (*See Plate* IV. *where the larger diviſions appear.*)

The firſt of theſe greater diviſions is a conſiderable one, and correſponds in office with the internal jugular of the human, it penetrates under the maxillary bone, and is the branch ſeen in the inner view of the head (*fig.* 2. *k*), and enters by a foramen, at the baſe of the ſkull; ſometimes it gives the temporal vein. The next branch furniſhes the maſſeter muſcle, in company with an artery, called the *external maxillary.* The third large diviſion gives at times the temporal vein, which is that ſeen in *Plate* (*vid. f.*); it paſſes under the ſpine of the maxilla, and anaſtamoſes principally with the external branch of the internal maxillary, and is given in a ſmall part to the muſcles around: but very little of it furniſhes the eye. The other branches of this third diviſion paſs up to the occipital bone, &c. and give rami to the inner part of the ſkull at the cerebellum. Beſides theſe larger diviſions, there are numerous ſmaller ones anaſtamoſing with all the other branches; nor do theſe diviſions always appear the ſame. The two upper trunks of the grand ſuperior diviſion of the jugular, form what anſwers to the human poſterior external jugular.

The poſterior Cava.

The blood is returned from the lower extremities, from the abdomen, and from the thorax below the heart, by the vena cava, and vena porta. The vena portarum is returning the blood of the chylopoietic and aſſiſtant chylopoietic viſcera, which are thoſe particularly concerned in the formation of the chyle, and the cava returns that from all the other parts. *The vena cava poſterior* is ſent out from the poſterior and lower portion of the right auricle, having but a very ſmall part of it contained in the pericardium. It gives firſt the coronaries which return part of the blood of the coronary arteries; as it proceeds it is continued on the right ſide of the ſpine, inclining rather towards the aorta, ſo that in the loins it is cloſe to it, whereas at its origin it is at a conſiderable diſtance from it. In its whole courſe it receives numberleſs branches, ſome ſmaller, and others larger, correſponding with, and returning the blood ſent by the arteries emanating from the aorta, except that of the chylopœtic viſcera; which, as we have mentioned, is returned by the vena portarum. As it paſſes through the tendinous portion of the diaphragm, rather to the right ſide, it gives two or three branches to this muſcle; from whence it paſſes through the great ſinus of the liver, where it receives the hepatic veins, which are indefinite in their number, but always numerous and conſiderable: from the liver, the cava is continued to the loins approaching the aorta, where it receives *the emulgents*, and the *right ſpermatic*; *the left* is uſually entering the left emulgent, to avoid the diſadvantageous courſe it muſt otherwiſe purſue. In the mare they are given to the ovaria, but in the horſe they accompany the artery out of the abdomen with the ſpermatic chord. The emulgents are uſually giving the *renal veins*, which receive the blood from thoſe glands. *The lumbar veins* are then receiving the blood given by the arteries of that name.

The cava having arrived at the termination of the lumbar vertebræ; bifurcates, from which reſults *the external* and *internal iliacs*. The internal furniſh the pudicæ internæ, and ſometimes the veins of the penis, which are receiving the blood diſtributed by the corresponding arteries. They likewiſe uſually furniſh the ſacral veins. The external iliacs give numerous branches anſwering to thoſe from the arteries of the ſame name: the *uterine* ariſe from them which uſually give a branch that is ramified on the tunica vaginalis of the teſticle, and not received into its ſubſtance as Bourgelat deſcribes. *The glutei*, *the obturatrix*, and *pudicæ externa*; and a particular branch to the muſcles of the abdomen, as well as the mammary in the mare. Paſſing out of the abdomen with the pſoas muſcle, under the Fallopian ligament, the external iliac takes the name of crural in company with the artery.

The crural vein is the continuation of the external iliac, accompanying the artery out of the abdomen, and paſſing between the pectineus and ſartorius muſcles. The firſt branch of conſequence it gives off, or as it may be ſaid receives, is the vein that principally forms the ſuperficial ſet of the poſterior extremities, which is called *ſaphena major*, and a ſmall branch on the outer ſide, not always preſent, called *ſaphena minor.*

The ſaphena appears along the internal part of the thigh, juſt under the ſkin, giving branches to the integuments, one of which is conſiderable; likewiſe a branch communicating with the poſterior tibial, then paſſing down the inner ſide of the leg, it uſually receives a conſiderable ramus from the anterior tibial, and is now carried obliquely on the inſide of the hock, over the inner condyle of the tibia; at which part, paſſing over the burſa mucoſa, it is liable on the diſeaſed enlargement of that capſule to become varicoſed, forming what is called blood-ſpavin: from this it is gaining the canon poſteriorly in a ſimilar manner with the artery, on the outer ſide; where piercing between the large and ſmall metacarpals it unites with the poſterior tibial, giving branches to all the ſurrounding parts, and to the canon, paſtern, and foot. From the anaſtamoſis we have mentioned exiſting in this vein in general, and particularly from that branch it receives from the anterior tibial, which is but a ſmall diſtance from it; when it becomes varicoſed, and it is neceſſary to take it up, it is evident that it muſt be done both above and below, or the anaſtamoſing branch will continue to dilate the ſac. (*See Blood-ſpavin.*)

The little ſaphena is not always preſent, but when it is, is carrying the blood from the external ſide of the hock and tibia into the ſaphena major. The crural, or femoral vein, having gained the poſterior and lower part of the femur, which it does in the ſame manner with the artery, receives the name of p oplital.

The popliteal divides into two trunks, which ſometimes form each of them into two or more branches, diſtinguiſhed by the names of anterior and poſterior tibial.

The poſterior tibial is following the ſame diſtribution with the artery, which it accompanies; receiving in its courſe the branches from the ſurrounding parts, as well as a conſiderable one from the ſaphena magnum, it paſſes with the artery and nerve into a groove of the calcaneum with the tendon of the perforatus muſcle *(ſee fig. 1.)*, where the nerve is ſeen that is accompanying it, though the vein is not, but which ſhews its courſe. From its paſſage at the poſterior part of the hock, it gives branches to the ſurrounding parts, and receives the name of *internal metacarpal.* It is continued down the poſterior part of the canon, towards the inferior of which it receives the ſaphena, and then dividing with the artery forms the paſtern veins, in the ſame manner as in the fore extremities.

The anterior tibial vein accompanies the anterior tibial artery from its origin, and paſſes with that under the edge of the extenſor longus pedis. In this courſe it gives a branch to the ſaphena, and then furniſhing the anterior part of the hock, is paſſing down under the ligaments to its poſterior part on the outer ſide, from whence it is called *external metacarpal.* It gives in this courſe branches to the ſurrounding parts, and is continued to the paſtern and foot, but principally to the canon and paſtern.

The veins of the feet are liable to become varicoſed from preſſure, and from inflammation, as in ſtrains, greaſe, &c. From greaſe they are very liable to become diſeaſed; when the cutaneous ones are at times totally deſtroyed; and the others conſequently much diſtended, and which muſt likewiſe tend to aggravate the diſeaſe itſelf; the returning blood being carried on ſtill more ſlowly: nor is it improbable that a varicoſed ſtate of theſe veſſels may be one of the cauſes of greaſe.

The Vena Portæ.

The vena portæ is formed from the veins returning the blood of the viſcera, concerned in the formation of the chyle; as the ſtomach, the pancreas, the ſpleen, the omentum, the meſentery, and the inteſtines. The branches by which the blood from the different viſcera is returned, correſpond with the arterial trunks by which they are furniſhed; but their trunks are more numerous, and their diameter enlarged. Having united, they enter a ſac, called the ſinus of the vena portæ, from the other end of which goes out the other trunks that carry their viſceral blood into, and throughout the liver. Theſe trunks that bring it from the viſcera, are called the *abdominal portions* of the vena portæ, while thoſe carrying it directly into the liver are termed the *hepatic portions* of the vena portæ: ſo that theſe appear as two large veins united by their trunks, whoſe diſtributions, or ramifications, run to contrary points: or like two trees united by their trunks, with their branches ſpread in various directions. From this it is ſeen, that the vena portarum is performing the office of an artery; reſembling it by its termination in exhalent orifices, and correſponding recipent veins, and its want of valves; but its muſcular coat is not diſcernible; nor is its elaſtic ſo conſiderable. The blood deprived of its bile in the pori biliari is returned by the extremities of another ſet of veins, which are termed the *venæ hepatica*, and which are terminating in the vena cava, as we have noticed. In the human, and in all quadrupeds that we are acquainted with, but the horſe and aſs, there is in the fœtus a communication between the ſinus of the vena portæ and the vena cava, by a canal termed ductus venoſus: but in the horſe and aſs this is wanting, and all the blood of the viſcera circulates through the liver in the fœtal ſtate.

General Remarks on the Veſſels.

The blood veſſels are liable to diſeaſes. A very general one affecting the arteries is the *diſtention* they experience under inflammation, when the capillaries are made to receive red blood. This forms the moſt general affection to which they are ſubject, for they are but little liable to *aneuriſm*, or *oſſification* in the horſe. However the coats are now and then diſtended of one immediate trunk, forming *true aneuriſm*. They are liable in common with other parts to injury, as from wounds; in which caſe they may either be ſimply punctured, or their whole trunk divided. When from a puncture blood is effuſed into the cellular membrane, it is called *falſe aneuriſm.* When the diviſion takes place, with an external opening, it forms *hæmorrhage* in either arteries or veins; and which is more or leſs dangerous, according to the ſize and ſituation of the veſſel. We have before remarked, that from the greater degree of tenacity of life, and the ſuperior quantity of muſcular coat to the arteries in the horſe, the diviſion of a very conſiderable branch will not prove fatal. An artery wholly divided is leſs dangerous than one partially ſo, becauſe when wholly divided it recedes under the integuments, and contracts. The diviſion of a vein likewiſe is not ſo dangerous as that of an artery, as it uſually gives way to preſſure, or to applications producing coagulation in the external orifice; but which coagulation does not ſo readily take place in the arteries, from the greater impetus in the blood, and the rapidity of its motion.

Oſſification of the arteries is a common effect of old age in the human, but is ſeldom obſerved in the horſe; for from the very conſiderable quantity of muſcular coat, they are perhaps not needing this ſympathetic effect; for oſſification of ſoft parts is only the conſtitution ſympathizing with the wants of the ſyſtem at large. Nevertheleſs this affection of the veſſels has ſometimes taken place: the meſenteric artery has been found enlarged and oſſified. This oſſification of the veſſels has been ſuppoſed to originate in the muſcular coat: but ſince in horſes this coat is much ſtronger, and in greater proportion than in the human, and yet oſſification is rarely happening; ſo it would appear probable, that it begins in the cuticular tunic. This remark, I believe, originated with the ingenious profeſſor of the veterinary college.

The veins are liable to two diſeaſes; one ariſes from a preternatural enlargement in their coats forming *blood-ſpavin:* but which does not appear uſually an original affection, but brought on by a dilitation in the mucous capſule of a part: generally in that of the hock. The other common diſeaſe of veins is *inflammation of their coats:* the morbid effects of blood-letting. There is at times an inflammatory tumour follows bleeding, and ſuppuration takes place, when the diſeaſed ſymptoms ſoon diſappear: but this ariſes from an effuſion of blood into the ſurrounding cellular membrane at, or ſoon after the operation: but the diſeaſe we mean, is an inflammation taking place immediately in the coats of the vein; which is always attended with troubleſome, ſometimes with fatal conſequences. This inflammation, it has been obſerved in the horſe, proceeds towards the head; but, in the human, it makes its way to the heart, with the courſe of the blood. All theſe different affections will be fully treated of when we enter on the diſeaſes.

It has been a very ancient cuſtom among ignorant farriers, to take up the veins in different diſeaſed affections; or what they term to *bar a vein,* particularly in œdematous ſwellings. This practice is founded in the moſt horrid ignorance; for in greaſe, ſcratches, inflamed eyes and feet, which are the uſual caſes in which it is done; it is evident, that every thing that obſtructs the return of the blood muſt highly aggravate the diſeaſe: but, if inſtead of deſtroying a vein, they could add two or three, they might do much towards a cure.

The arteries and veins are ſometimes purpoſely wounded for the diſcharge of their contents, by which the column of blood is leſſened. This is termed *phlebotomy*, or *blood letting*, and is either local or general; the different modes of which we ſhall treat of in another place.

The courſe of the veſſels of the body are admirably adapted to their various uſes and capacities: the arteries, as being highly important, and not to be wounded with impunity, are paſſing deep and ſeeking the moſt protected courſe. The veins are wiſely of two orders, a ſuperficial, and a deeper ſeated ſet, by which the blood is at all times enabled to return freely to the heart. By the ſuperficial order, when from ſtrong action the muſcles have become ſo diſtended as to preſs on the deeper trunks, the blood is carried forwards. This appearance judicious painters always expreſs when they depict a horſe either in action, or immediately after it; by which nature is followed, and great force, beauty, and ſtrength, given to the repreſentation. But ignorant painters ſeeing this, have fell into great error; for it is not unuſual to ſee two portraits of the ſame horſe; one immediately after, or before rubbing down, from the winning a ſweepſtakes, and another when he is grazing; with each the ſame number of ſuperficial veins, ſwelled and prominent. It is likewiſe evident, that a very intimate knowledge of theſe veſſels is neceſſary to enable an artiſt properly to pourtray an animal under exertion, but which is by no means ſufficiently attended to: thus we find frequently veins marked where there are none, and others omitted where they would have given great force and expreſſion, and accorded with nature. The ſuperficial order in the face are always prominent on exertion, particularly thoſe running over the anterior part, and more immediately that correſponding with the angular artery, near the inner angle of the eye. The greater the exertion, and the finer the ſkin, the more prominent theſe ſhould be made to appear: but they are very little ſeen when a horſe is at reſt, unleſs his ſkin is very thin, or his hair very ſhort; though they frequently are very injudiciouſly marked in paintings as very ſtrong, when no exertion has taken place, and in every variety of animal.

Abſorbent Syſtem.

There is a ſet of veſſels in the body whoſe exiſtence was for many centuries unknown, and whoſe uſe was not diſcovered for many more. The acquaintance with this ſyſtem and their functions, called the *abſorbing*, or *lympatic ſyſtem*, has led to the greateſt improvements in our treatment of diſeaſes, and thrown more light upon the animal œconomy, the circulation of the blood excepted, than any other diſcovery. The exiſtence of this important ſet of veſſels was early known; Galen ſpeaks of them as being ſeen by Eraſiſtratus in a goat, who called them arteries. Euſtachius deſcribes the thoraic duct (which he diſcovered in a horſe) but as a vein of a particular kind (*vena ſine pari*). In the middle of the 17th century, Pecquet, on opening a living dog, found a white fluid mixed with the blood; ſuſpecting this to be chyle coming from the inteſtines, he ſet himſelf to trace it from them through its veſſels, whereby he became acquainted with the exiſtence of the thoraic duct, and its uſes. He from this ſoon diſcovered the ſame in the human; from whence this ſyſtem began to be diligently inveſtigated, and from theſe reſearches the lymphatic was added to the diſcovery of the lacteal. Ruyſch and Dr. Meckel, greatly aſſiſted in the perfecting our knowledge on this head, and of later date, Drs. Hunter and Monro, called the attention of the curious to this ſubject, in their famous controverſy concerning the diſcovery of the office of the lymphatics. We have likewiſe Mr. Sheldon and Mr. Cruikſhanks who have rendered much towards the harveſt of facts, that was to be reaped from this intereſting topic. The lymphatic ſyſtem was for ſome time after its diſcovery conſidered as an obſorbing ſyſtem; but in a little time, from the minuteneſs of its veſſels, and other circumſtances, this became doubted; and it was afterwards more generally conſidered, that theſe veſſels were only a peculiar continuation of either the arteries or veins. Haller favoured this opinion, but the experiments of Drs. Hunter and Monro put their real uſe beyond doubt, and future anatomiſts have only added to the ſtrength of their aſſertions.

The abſorbents are very ſmall tranſparent veſſels, ariſing in every part of the body, and all tending, as far as we know, to one common termination or depoſit. As veſſels, they contain fluids which are as various as the parts from whence they are derived. Hence they have gained a diviſion into *lacteals*, or thoſe from the inteſtines and meſentery as carrying *a milky fluid*; and *lymphatics*, or thoſe of every part of the body as containing *a limpid fluid*. Abſorbents, though almoſt tranſparent, are nevertheleſs very ſtrong, and appear from the experiments of Mr. Cruikſhanks, to have two coats, one of which is ſuppoſed muſcular. They are capable of great diſtention, and yet recover their original ſize, and will bear quickſilver, which veins will not. Their valves are very numerous, and have been demonſtrated as being ſemicircular, diſpoſed in pairs, and at ſome diſtance from each other. In ſome parts their valves are more numerous than in others, as the reſiſtance to the paſſage of their fluids is greater, and requires a more conſiderable force and aſſiſtance to propel them. It has been ſuggeſted by an ingenious phyſiologiſt, that the valves themſelves are properly muſcular, and aſſiſt in the propelling their contents. In animals theſe valves make them appear in ſome inſtances like a chain, when they are diſtended with fluid. In all the larger quadrupeds, this ſyſtem is very large and ſtrong, particularly in the horſe: thus we ſee very conſiderable ſwellings in the legs very ſoon removed by rubbing, or exerciſe. In the human likewiſe they are very conſiderable, though probably not ſo much ſo as in the horſe, but ſufficiently ſo to enable us to account for the ſpeedy effect of ſome liquids taken in, and ſoon thrown off by urine, as ſpirits, &c. &c. From circumſtances, we have reaſon to conclude, their living powers great; they are highly ſenſible under inflammation; this we are aware of, by a diſtenſion of their coats forming a riſing hard line under the ſkin, and which is exceſſively painful and tender to the touch. When wounded alſo, they become ininflamed to a high degree.

The lacteal abſorbents, are that part of this ſyſtem that is ſituated in the meſentery and inteſtines. They are ariſing from the inner ſurface of the inteſtines, particularly the ſmall ones, by means of the villi, which Dr. Hunter diſcovered to be nothing more than the numerous orifices of theſe ſmall veſſels. From the cavity of the inteſtines, they paſs obliquely through the coats to gain that part to which the meſentery is attached, uniting as they proceed into larger branches, which are paſſing from the alimentary canal on the meſentery; when they are continued through conglobate glands ſituated in it, and thence called meſenteric. From their origin in the inteſtines to theſe glands, they are called *primary*, or *original lacteals, vaſa inferentia vel lactea primi generis.* The *meſenteric glands* are of different ſizes and numbers; and in ſome animals, as the dog, are not diſperſed, but are connected into one glandular maſs, called *pancreas Aſſellii* from its diſcoverer. As the lacteals paſs out of theſe glands towards the thoraic duct, they are called *ſecondary, vaſa efferentia vel lactea ſecundi generis.* Thoſe of the ſmall inteſtines, and which are the moſt important, at leaſt in the human, commonly run to the roots of the meſentery; and uniting into an indefinite number of conſiderable trunks, they accompany that artery, as is expreſſed in the plate of the viſcera; from which they deſcend by the ſide of the aorta, and terminate in the receptaculum chyli. Thoſe of the large inteſtines, and which are numerous in the horſe, ariſe by trunks that paſs up the vertebræ with the aorta, and are entering with the lymphatics. Theſe veſſels are obſerved to take up from the inteſtines a fluid which they carry forward towards the thoraic duct. That this is the caſe, we know from the effects of certain experiments. The contained fluid is found ſimilar with that formed from the chyme. A tinged fluid has been thrown into the inteſtines of a dog, and on killing him ſometime afterwards, the lacteals were found filled with the colouring matter. They have been tied, and the part between the ligature and the inteſtines has been found diſtended. The power by which this abſorption is effected has been variouſly accounted for. Tubes of a very ſmall dimenſion are found to raiſe water, as well as other fluids in them, to a certain height: this has been called *capillary attraction*, and by this power it was ſuppoſed theſe veſſels acted: but was this the caſe, they would take in every fluid indiſcriminately capable of entering their calibre: but that this is not the fact is evident, as they have a power of refuſing any thing but the chyle; hence the bile and other fluids are left unabſorbed, while the chyle is taken up. Mr. Hunter has ſuggeſted, that it ariſes from a living principal within themſeves, whereby they are capable of taking up what is proper to them only. Or there may be a particular ſympathy between the decompoſed fluid formed from the mixtures of chyme, bile, and pancratic juice, and their orifices, by which they open to receive it. Or all other ſubſtances may ſtimulate them to contract. They have not only the power of receiving this appropriate fluid, but of propelling it forward towards the receptacle, and this Mr. Cruikſhanks has aſcertained is done by a very active and conſiderable energy; for in the lacteals it appeared, the chyle was conveyed at the rate of twenty feet in a minute. We are, therefore, at no loſs to account for the renovating effect of cordials upon the ſyſtem, nor of that of diuretic ſubſtances, particularly on ourſelves whoſe poſture favours the paſſages of theſe ſubſtances through the ſmall inteſtines. This power is, therefore, probably brought about by their muſcular coat, which it is pretty evident they poſſeſs.

The lymphatic abſorbents appear not materially to differ from the lacteals, but in their ſituation: while the former are diſtributed over every part of the body, theſe we have ſeen are confined to the inteſtines, and principally in the human to the ſmall ones; but in the horſe there muſt be conſiderable trunks from the large likewiſe. Theſe abſorbing veſſels have likewiſe their conglobate glands through which they paſs; and the exiſtence of theſe glands is ſo conſtant (though it is ſaid ſome animals are without them), that we are led to ſuppoſe the lymph undergoes ſome material change within them. There are ſome conſiderable ones always ſituated in particular parts, as in the axilla and groin; and there are others ſmaller diſperſed over the whole body. *The lymphatic glands* of the horſe appear more liable to diſeaſe than the *meſenteric*; but in the human, the meſenteric are more ſuſceptible of diſeaſe than the lymphatic. Theſe glands are very vaſcular, and appear more diſpoſed to inflammation than the veſſels themſelves, as we ſee by the abſorption of cantharides in bliſter, which will paſs without irritating the veſſels themſelves, but frequently irritates the glands. Some morbid poiſons likewiſe occaſion abceſſes in the glands without affecting the veſſels by which they paſſed.

The knowledge of the functions of the abſorbing ſyſtem is of the utmoſt conſequence to our practice in the healing art. Till this was known not only were we unable to account for many appearances that we now know the cauſe of; but we were unable to bring about many effects in the conſtitution, now perfectly under our command. By the lymphatic abſorbing ſyſtem, the moſt ſurpriſing changes are effected in the conſtitution. Mr. Hunter aſcribed to theſe veſſels the power of new-modelling parts; and the various phenomena attending the alteration of parts, as well in health as diſeaſe, is juſtly aſcribed to them. From numerous facts, we are certain, that all parts of the body are continually changing their component parts, perhaps as not being capable of proving longer ſerviceable, having a conſtant tendency to decay. It appears the office of the arteries is to carry, form, and depoſit new parts; but which are firſt of all pulled down and removed by the abſorbents. This power is wonderfully ſubſervient to the general preſervative principle in the ſyſtem, whereby its operations are directed to a ſalutary effect, and ſuch parts removed as are immediately appropriated to their reception, or uſeleſs in the machine. By this wonderful power the alveoli are removed, when their ſharp edges would injure the gums; the roots of the temporaneous teeth are abſorbed that they may be eaſily removed; the gubernaculum teſtis having fulfilled its office, is abſorbed; the thymus gland likewiſe. The vaſcular cartilages are removed by the abſorbents to make room for the bony depoſit when the animal approaches maturity. By theſe likewiſe both the ſolids and fluids are continually changing and carried back into the maſs of blood, and re-depoſited by the arteties. It is by theſe that ulceration is carried on, coagulable lymph taken up, and extravaſated blood removed. By theſe it is that ſplents are ſometimes diſappearing, more particularly when theſe veſſels are ſtimulated to unuſual action.

There is no part that we know of that is deprived of theſe veſſels: they are not to be ſeen in the brain, but from the effects produced there is no reaſon to doubt their exiſtence. This being the caſe, it will neceſſarily form a ſuperficial and a deeper ſeated ſet: one common to all the ſolid parts and cavities, and another more immediately appropriate to the ſkin, ſurface, and ſuperficial parts. The firſt, it is evident, muſt principally act on the body itſelf, the others receive ſubſtances from without. The whole ſurface of the ſkin ſeems pervaded by two orders of veſſels or of openings; one whereby exhalation is going on and parts carried off; and another where ſubſtances are received, which are the orifices of the abſorbents. By this latter order it is ſuppoſed oxygen * is abſorbed into the ſyſtem. In inſects we know that it is, as the ſmearing their ſurface with oil will deſtroy them, by preventing this neceſſary abſorption. By theſe ſurfaces humidity is taken in from the ſurrounding atmoſphere † ; and hence horſes grazing do not require much water, and eſpecially if not expoſed to the heat of the ſun, whereby evaporation or exhalation is promoted. And this, it is probable, is more effected by the moiſture taken up by the abſorbents, than by the moiſture contained in the graſs, which muſt be trivial compared to that which is received in a dewy night from the extended ſurface of the body. It is by this abſorbing power that ſome animals, as rabbits, &c. do not drink at all; taking all their aqueous nutriment from the ſkin and edibles. Hence likewiſe unfortunate mariners, deprived of freſh water at ſea, wrap cloaths wet with ſalt water around them; when the abſorb-

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* It is known that the aptitude in the abſorbents to receive is not only greater at ſome times than at others, but that the particular aptitude to receive particular ſubſtances is not always alike, while the general diſpoſition towards it may remain the ſame: and as it known that the ſkin abſorbs nitrous and hydrogeneous gaſſes; may not a diſpoſition to take up a particular quantity of one or other of theſe or other gaſſes, occaſion diſeaſe? In fact, might not putrid fever be occaſioned by this means?

† It may poſſibly be objected that the ſpiracles of inſects are not properly abſorbing orifices, but ſimply paſſive cavities by which the air enters by its own gravity. Be it ſo; yet theſe cavities muſt have abſorbents to take up the oxygen from hence.

ents have the power of refuſing in a great meaſure the ſalt, taking the aqueous particles alone, and thereby leſſening the thirſt.

Practitioners in medicine of the preſent day have made the knowledge of this power in the abſorbents ſubſervient to their uſe, and frequently employ this ſuperficial order for the introduction of various ſubſtances into the ſyſtem, ſome of which we could not ſo conveniently do by the ſtomach *; and it is not improbable, that there will be great future improvements in this practice. In the human ſubject it has long been common to introduce mercury into the conſtitution by this means; and though it has been doubted whether this metal was ever found in a ſolid form, yet we know that perſons under a mercurial courſe have frequently found the money in their pockets tinged. It is likewiſe ſaid thoſe who work in quickſilver mines, on even putting a piece of gold in their mouths, immediately produce it completely ſilvered; add to which, that Longbottom, the late articulator, had in his poſſeſſion a man in whom mercury was evident in the cancelli of the bones.

We have hitherto ſpoken only of the *healthy* and *ordinate action* of theſe veſſels: but there appears

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* Dr. Chiarenti of Florence has lately brought forward ſome experiments, whereby he endeavours to prove that we may make ſtill more uſe of the abſorbents in the cure of diſeaſes than we at preſent do. Squills diſſolved in gaſtric juice is a much more certain diuretic, he has found, when rubbed on the ſkin, than any medicine introduced into the ſtomach.

ircumcircumſtances under which they have an *unhealthy* and *inordinate action*, and which forms one of the ſtrongeſt reaſons why abſorption is not to be conſidered as an act of capillary attraction: if it were, the capacities would ever remain the ſame; but we find ſo far from this, that ſometims they are ſcarcely acting at all, while at others they are empowered with even too much energy; and as a farther proof, we are enabled by various means to ſtimulate or rouſe them to increaſed action. It has been ſuppoſed the diabetes was originating in a diſeaſe in the lymphatics, whereby too great a quantity of fluid was abſorbed; hence oil was directed to be rubbed on the ſurface; but though this diſeaſe is now differently accounted for, yet we are aware that the ſkin at times is diſpoſed to take up an increaſed quantity of moiſture.

Morbid poiſons are ſuppoſed to be abſorbed by theſe veſſels, and it very probably that in ſome inſtances they are. It is farther probable that a peculiar ſtate of them exiſts at particular times, when they are more diſpoſed to take up noxious ſubſtances; as deleterious gaſſes, morbid contagions, &c. than at others. The hydrophobia, there is reaſon to believe, may be gained by theſe means. In the diſeaſe termed mollities oſsium, from an inordinate exertion of theſe veſſels, the earthy part of the bones is taken up faſter than it is depoſited, from which they become weak and on ſlight exertions break; the earthy parts in theſe caſes is paſſing off in great quantities by the urine. The ingenious Dr. Darwin, the eminent author of *The Loves of the Plants*, has ſuppoſed a retrogade motion in the abſorbents in ſome diſeaſes, particularly in the diabetes; but from experiments it appears to have been proved, that no ſuch perverted motion can exiſt: for was this the caſe the thoraic duct would not be found burſt as it has been on being tied.

It is more than probable that the farcy ariſes from ſome improper abſorption of theſe veſſels, whereby their coats are ſtimulated to contract and inflame. The ingenious profeſſor of the Veterinary College ſuppoſes this diſeaſe to ariſe from an increaſed ſecretion in the arteries, in which, as the abſorbents are incapable of increaſing their action to an extent equal with the depoſit, they ſwell and inflame, and buds ariſe; but it would appear, if this was the common cauſe, that in all anaſarcous ſwellings, there would likewiſe be ſimilar buds, which is by no means the caſe. As theſe veſſels at times exhibit a more than ordinary energy, ſo at times they ſeem almoſt inert; hence in ſome horſes there is a conſtant watry depoſit in the heels and fetlocks, from which one might judge that the abſorbents have not ſufficient power to carry it off. This may be compounded of increaſed depoſit in the arteries and ineficient abſorption in the lymphatics; or it may be ariſing from a defect in either of theſe without the concurrence of the other; but whichever it is, we are enabled to remove it by ſtimulating theſe veſſels, whereby their action is increaſed.

The means by which we can excite theſe abſorbents to increaſed action are various. Mechanical friction is one of theſe: hence it is that rubbing the legs proves ſo beneficial both to remove theſe ſwellings of them, and to prevent the recurrence; it has been this that induced antient farriers to beat a ſplent before they put on a bliſter. We can likewiſe ſtimulate theſe veſſels by mercury; thus we apply various preparations of this metal to ſplents, ſpavins, &c. whereby the bony depoſit is removed. Mr. Coleman, I believe, ſuppoſes that mercury has leſs effect on the abſorbents of horſes, than on thoſe of the human. It is certain, however, that theſe exoſtoſes may be removed by the application of mercury. Preſſure alſo ſtimulates them; from which it is we girth horſes tight to promote abſorption of the adeps and interſtitial fluid. Cantharides has an effect upon them: thus we bliſter ſwellings, exoſtoſis, &c. and laſtly, one of the ſtrongeſt ſtimulants that we know to this ſyſtem, is the actual cautery; from which ariſes the very common and free uſe of fire in veterinary practice, to all obſtinate and diſeaſed enlargements; and from experience we are aware that it is the moſt powerful means of promoting abſorption that we are acquainted with. There are other means that we can make uſe of in the human, but which cannot be accompliſhed in the horſe.

Fear has a very powerful effect on this ſyſtem, wonderfully increaſing their action *. There is likewiſe a ſtrong ſympathy between the ſtomach and the abſorbent ſyſtem at large, whereby nauſeating medicines increaſe their action powerfully †. But neither of theſe auxiliaries are we enabled to avail ourſelves of in the animal in queſtion, though we might to kine ſheep, &c.; therefore our practice muſt be directed to ſuch means as we can make uſe of. The ſtrength of the abſorbents is not always dependant on the general ſtrength of the ſyſtem, for we find them often acting moſt ſtrongly when the general ſyſtem is weak; and ſometimes they appear to be weak when the general ſyſtem is ſtrong, as in the ſwellings of the legs in plethoric horſes; though I am aware that it may be urged, and perhaps with propriety,

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* A boy with a conſiderable abdominal dropſy, for the removal of which the operation of tapping was determined on, was ſeized with ſuch terror, that it was thought prudent to ſuſpend the operation till the next day. When at that time he was examined, the belly was found conſiderably leſs and ſofter, and that much of the contents had been abſorbed; which from that time continued till the diſeaſe was entirely removed; ſuch were the ſurpriſing effects of fear.

Saumarez Phyſiology, Vol. II. p. 430.

† I have myſelf with the happieſt conſequence recommended emetics in humoral hernia of the human. In ſome inſtances I have ſeen the contents abſorbed in a night, after having continued diſtreſſing the patient for many weeks; and in other caſes of diſeaſed collections, I have witneſſed the ſalutary effects of continuing emetics every other day for ſome time.

priety, that even the ſwellings in theſe caſes is true local debility. Again, at other times they accompany the ſtate of the conſtitution in general, with regard to its ſtrength or weakneſs, as in the depoſit at ſpring and fall, when horſes have a general debility pervading them, in conſequence probably of ſome action at that time in the conſtitution going on to effect a change in their coats, when the extreme branches of the veſſels having to exert themſelves in the formation of new hair, the parts are become weakened, or have ſome ſtate connected with their exhaling powers whereby fluid is either depoſited in greater quantities; or the ſyſtem being generally weak, is not able to effect a removal of it.

The lymphatics of the hinder extremities are ariſing within the coffin, all around the laminated ſubſtance, paſſing up on each ſide of the paſtern in ſeparate trunks, and continued up the canon on the outer ſide of the ligaments; when arrived at the hock they gain the inner ſide, receiving branches from the outer; here the trunks are found to be numerous, paſſing up the inſide of the thigh in ſeveral conſiderable trunks till they reach the inguinal glands, which are ſituated in the groin near the ſcrotum, in the horſe, and the bag in the mare. The lymphatics of the penis and muſcles of the abdomen, are poured into them here, from whence the whole paſs out from the inguinal glands and enter the abdomen with the crural veſſels. The inguinal glands vary in number and ſize, and it is worthy of remark that there are but few, if any, lymphatic glands of moment between the feet and groin. Independent of theſe, likewiſe there are ſome *deeper ſeated lymphatics* that follow the courſe of the deep ſeated veſſels, and are uniting with the others in the inguinal glands. When the whole therefore are come within the pelvis, they receive ramifications from all the parts within, and from without likewiſe: when accompanying the aorta in ſeveral conſiderable trunks they enter the receptaculum chyli. Beſides the lacteals, the abdominal viſcera it muſt be evident, furniſh very numerous lymphatics.

The lymphatics of the head, neck, and fore extreties, are all of them, like what we have deſcribed, a ſuperficial and a deeper ſeated ſet. In the head they are ariſing from all its parts, and paſſing down the neck, ſome accompany the carotid artery, others are ſituated more ſuperficially. Thoſe of the fore extremities ariſe, as thoſe of the hinder; and are continued *a deeper ſeated ſet* with the artery, and a *ſuperficial order* on the inner ſide of the arm; both reach the axillary glands, which are ſituated in the neck, juſt before the rib where the ſaphena vein originates: paſſing through theſe glands they terminate by one or more large trunks at once into the thoraic duct.

The thoraic duct is formed uſually of an enlargement termed *receptaculum chyli,* which is nothing more than the received trunks of the lacteals and lymphatics. This receptacle is by no means of a definite appearance or ſize; ſometimes it is hardly bigger than the duct itſelf; at others it is very conſiderable, and in ſome inſtances it is divided into two or three trunks which at length form the thoraic duct. It is ſituated upon the vertebræ near the emulgent arteries, and is continued up between the vena arygos and aorta, between the crura of the diaphragm, and paſſes under the aorta to be received obliquely into the left jugular vein, or at times into the junction of the jugular and axillary. Red blood has been found within this duct in aſſes, and from whence it is ſuppoſed that abſorbents ſometimes ariſe from veins. Collateral and anaſtamoſing branches have been ſaid to exiſt in this trunk, but Mr. Cooper has tied the trunk alone, and found the animal died at ſuch a time and in ſuch a manner as to ſhew that he periſhed from want of nouriſhment, and not from the effects of the wound. Thus we have in ſome meaſure attempted to deſcribe the ſtructure and functions of this very important ſet of veſſels, and I would here remark to the ſtudent, that any attention he pays to this curious ſubject will amply reward him for all his labour and reſearch. By the diſcovery of the abſorbents many of the moſt puzzling phenomena become eaſily comprehended, ſome of the moſt obſtinate diſeaſes to be effectually checked, and many of the moſt groſs errors to be reprehended. It has always ſtruck me that nothing more forcibly overturned the humoural pathology than the knowledge of the functions of this ſyſtem. If the blood was ſo eaſily vitiated by ſome diſeaſes, and rendered groſs, viſcid, or thin, upon every occaſion as was formerly taught; how conſtantly muſt it be altered in its nature and qualities from the various ſubſtances abſorbed, many of which are diſeaſed, and moſt of them rendered unfit for the purpoſes of life before they are taken up; yet the blood is enabled to preſerve its integrity entire, and by its living powers to reſiſt the tendency to alteration from the admiſſion of this compounded fluid, and which is perhaps by this ſame living power only mechanically, and not chemically mixed with it; whereby its fœcal parts are thrown off in the next circulation, by the various emunctories. Or is it poſſible, that the lymphatic glands may have a power of rendering all the various ſubſtances taken up by the lymphatics, innocuous before their entry into the blood: that ſome change is produced within them is very probable.

SECTION XIII.

Neurology.

THE *nerves* are white maſſes ſent off from the brain, ſome of which proceed in one trunk, out of holes in the cranium from that viſcus itſelf; others ariſe from a large maſs called the ſpinal marrow, which is extending down the vertebral canal, and giving off trunks through the vertebral holes. The nerves in themſelves appear long whitiſh cords whoſe internal ſtructure is fibrous, and whoſe outer ſurface is ſuppoſed to be connected by membranes, though no coats have been demonſtrated but on the optic. Theſe *nervous fibrillæ* are thought to be the ultimate branches of the ramified nerves; hence how infinite they muſt be we may eaſily ſuppoſe. Nerves are diſtributed to every part of the body, and are ſuppoſed to become ſoft and pulpy in their ultimate terminations. It has likewiſe been ſuppoſed, they are tranſparent, as the retina is known to be ſo. We are aware that thoſe which terminate in the organs of ſenſe are ending pulpy. It is ſuppoſed that the brain is the ſeat of ſenſation, and nerves only the meſſengers of it to all the parts; and though this is the moſt generally received opinion, yet there have been and are now ſome eminent men who diſſent from it. Dr. Monro, two days after the cutting off the head of a frog, found him ſitting in the uſual poſture of thoſe animals; the circulation was carried on, and he was ſenſible of pain, jumping when his toes were pinched; therefore he concludes that the brain is not the ſole ſeat of the *ſenſorium commune*; but that the texture of every branch of a nerve is ſuch as to furniſh it with ſome nervous energy. Dr. Johnſton has ſuppoſed that the ganglions were in themſelves little brains. The phenomena of nervous influence are at preſent inexplicable; all that we can be confident of is, that it is the immediate cauſe of ſenſation; for when the nerves are deſtroyed, ſenſation ceaſes, and notwithſtanding Dr. Monro's experiments, that generally the ſenſibility of a part is dependant on its being connected with the brain by means of the nerves. But though the diviſion of a nerve going to a part deſtroys the ſenſibility of that part, it does not deſtroy its vital powers. The ſciatic and crural nerves of a dog were divided on one ſide, near Poupart's ligament; it was unneceſſary to divide the obturator, for it is only diſtributed to the triceps muſcle. The tendo achilles was then divided on both ſides; in three weeks the animal bore ſlightly on the part where nervous energy remained; in the other he walked on the whole metacarpus. When examined, the tendo achilles was found equally well united in both limbs; and on injecting the veſſels, thoſe on the ſide where the nerves had been divided were found rather the largeſt; therefore the vital principle remains without nervous energy.

Senſibility is uſually proportioned to the quantity and ſize of the nerves a part poſſeſſes: it is evident therefore they muſt exiſt in far greater plenty in ſome parts than in others; thus they are large and numerous in the panniculus carnoſus, which it is neceſſary ſhould be highly ſenſible to ſhake the ſkin on any approach of noxious inſects. Nervous influence is the occaſion of another very important phenomenon, which is that of motion. Not only the ſenſation of a part, but its mobility is loſt upon dividing the nerves going to it. *The mobility* of parts brought about by nervous influence is in ſome dependant on the will, and in others it is independant of it. In the one inſtance it is termed *voluntary motion*, in the other *involuntary motion.*

The nerves have their origin from particular parts of the brain, and I think it appears that the affection of parts of that organ have affected particular nerves*. It generally happens that if a nerve is tied very ſlackly the ſenſibility is leſſened, and the part becomes numb; if the preſſure is inceaſed, or the ligature tightened, the ſenſibility is altogether loſt. Nerves are capable of re-union after they have been divided, that is, a ſubſtance is interpoſed between, poſſeſſed of the power of carrying on nervous influence. Dr. Haighton, the ingenious lecturer on phyſiology, made a diviſion of the crural nerve of a dog, in which operation I aſſiſted: in ſix weeks, the ſenſation and mobility of the limb, from being ſenſeleſs and paralytic, was complete. On diſſection, an interpoſed ſubſtance was found between the divided ends rather larger in circumference, and ſlightly to appearance differing in ſtructure; of this I made a drawing which was preſented to the Royal Society, accompanied with a memoir of the experiment, by the ingenious profeſſor. From other experiments conducted by the ſame gentleman, it ſeems decided,

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* A gentleman with whom I am acquainted, was ſtopped by a man who attempted to rob him, but being both bold and ſtrong, he refuſed, and made an effort to ſecure the robber, who took to his heels with the gentleman purſuing. A perſon was coming along the ſame road, to whom the purſuer called out to ſtop the footpad, which he attempted; but in the ſtruggle the footpad fired

fired a piſtol at the man, who immediately fell, and the robber eſcaped. On the gentleman's queſtioning him where he was wounded, he replied, he had broke his thigh; but on examining it, no wound or fracture could be diſcovered; but when he was, with aſſiſtance, taken to a houſe, it was found that the ball had taken away a portion of the ſkull, and with it a ſmall part of the brain, and on the contrary ſide to that on which he complained of lameneſs. He was from hence removed to a hoſpital, where he recovered of the wound in the head, but I believe remains to this day lame in the thigh he firſt complained of, though no external injury could ever be obſerved on it; but it is probable that the portion of brain removed had a particular connection with the crural or ſciatic nerves.

that nerves may be re-produced. He divided in a dog the eighth pair of nerves in ſucceſſion, and the animal died ſome hours afterwards: he then divided one only, and ſuffered a period of nine days to elapſe, when he divided the ſecond. From the diviſion of the firſt he experienced no very great inconvenience, but in a few hours after that of the ſecond he died. In another inſtance he permitted a period of ſix weeks to take place between the diviſion of the firſt and ſecond, when the animal lived; but it was ſome months before the functions of the ſtomach were complete. To prove that this aroſe from the interpoſed ſubſtance poſſeſſing the true power of nerve, and that the ſtomach was not furniſhed from any other ſource; he divided theſe united nerves of this dog in ſucceſſion, and the effect was, that he died in two days. It is remarkable, that the diviſion of the parvagum in the horſe produces inſtant death; but a dog lives often thirty-ſix or forty-eight hours afterwards.

If any part of the ſpinal marrow is compreſſed or torn through, the nerves ſupplied from it to the parts beyond the injury are rendered inert: if this happens above the origin of the phrenics, the animal is deſtroyed immediately, becauſe reſpiration is totally ſuſpended. The nervous cords are furniſhed with blood veſſels which ramify on their ſurface; but red blood is not ordinarily circulating within them. The ſtructure of theſe nervous cords deprived of the ſurrounding cellular ſubſtance is not poſſeſſed of much elaſticity. They are uſually ſo placed as to paſs in the moſt protected manner, the larger branches generally accompanying the deep ſeated arteries.

Nerves when they have divided into branches, are frequently again uniting into a ſpecies of knot which is called a ganglion, and from which proceed branches diſtributed to the parts around. As theſe ganglions are almoſt confined to the nerves communicating with, or being jointly formed from the great ſympathetic, and going to involuntary parts, it has led to ſome peculiar ideas of their uſes*. The nerves of young animals are ſaid to be larger

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* Dr. Johnſton, an ingenious author, has claimed the attention of the public on this head ; he obſerves, that as the bulk of a ganglion exceeds its component nerves and veſſels, and as it has ſeemingly a different ſtructure, ſo he conjectures it has ſome different uſes, which are the ſupplying involuntary muſcles with nervous energy, but in ſome reſpects altered, ſo as not to be under the influence of the will ; this he conſiders is ſtill more evident, as the nerves going to voluntary parts are not furniſhed with theſe nervous knots; he therefore concludes that ganglions are *little brains*, and that by this means the motions of involuntary parts are carried on during ſleep. But theſe ideas of Dr. Johnſton have little novelty. Lanciſi, an ancient Italian author, who examined the ſtructure of the ganglions in the horſe, ſuppoſed them likewiſe *little brains*, or ſubſtitutes for that viſcera ; whoſe uſe was the altering the regular diſtribution of nervous energy, and giving it a peculiar deſtination, as appears from the following quotation :

" Lanciſi

larger and more numerous than thoſe of older, and hence their irritability is greater: from which reaſon they have much fat, to protect theſe nerves from too great irritation.

The mode in which nervous influence is tranſmitted, as well as its nature, has occaſioned various theories. It has been ſuppoſed, that the nervous cords were vibratory: others have conjectured them to be veſſels tranſmitting a wonderfully fine fluid: others, and probably nearer the truth, have ſuppoſed that nervous influence was purely vital and immaterial. The inſtinctive property probably reſides principally in the nerves, while the intelligent principle exiſts principally in the brain: hence brutes, in whom the intelligent principal is weak, but the inſtinctive faculties ſtrong, have the organs of ſenſe large and acute, and the brain ſmall. The ſize of the nerves proceeding from the brain are larger or leſs, as the organs they are intended to furniſh are, by nature, intended to be more or leſs active in their power; but the ſpinal nerves are

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"Lanciſi qui a examiné les ganglions dans le cheval, et qui du "reſte les a enviſagés comme de petits cerveaux, ou comme des "ſubſtituts de ce viſcere, a cruy appercevoir trois tuniques, l'une "externe vaginale, l'autre moyenne echarnue, et la troiſieme "tedineuſe. Nous n'avons pas été aſſez heureux pour dêmèler "cet appareil; quoi qu'il en ſoit, il a conclu d'après cette ſtruc-"ture muſculeuſe, qui les ganglions peuvent brider les fibres "nerveuſes et fournir une nouvelle augmentation de mouvement."

uſually proportioned to the ſize of the parts ſimply.

Nerves may be ſtimulated into action by various means, but nervous ſuſceptibility becomes leſſened by the continuance of ſtimuli. The irritability of ſome nerves is ſuch, as to produce a quick exhauſtion of that ſomething whereby their phenomena are produced; hence fiery horſes are ſeldom found laſting; and thus it is diſeaſes of increaſed action end in debility. Nerves occaſion a ſympathy in parts remote from the ſeat of action; this is not ſo evident in the horſe, though from the perpendicular ſituation of the hair, or what is called ſtaring of the coat under ſome circumſtances, there is reaſon to ſuppoſe the ſkin ſympathyzes with the conſtitution: but the ſtomach appears not ſo ſympathetic an organ as the human ſtomach, for nothing nauſeates the horſe: nevertheleſs, he may be put off his appetite by means acting on other parts. In dogs there is a very great ſympathy between the noſe and urinary organs.

We have no reaſon to ſuppoſe there is any of thoſe diſeaſes termed nervous in the animal in queſtion. The only diſeaſe we know the nerves of the horſe are ſubject to, is locked jaw, which ſeems an increaſe of the action of the brain, or of that action which communicates nervous energy to the muſcular fibre: hence preſſure on the brain has been found for a ſhort time to relieve it.

The Cerebrine and Spinal Nerves.

The cerebrine nerves are thoſe which immediately ariſe from the brain, and are uſually conſidered as nine pair of original trunks, which are going out of the ſkull by different paſſages, through openings in the bones, and are diſtributed to the various parts of the head.

The firſt pair, or olfactory, are large and hollow, compoſed of both cortical and medullary portions of the brain, ariſing from the anterior and inferior part of this viſcus; appearing by this means as it were a continuation of its ſubſtance. As this cavity appears a continuation of the third ventricle, it induced the ancients, who gained their anatomy from brutes, to give to theſe nerves in the human, the name of mamillary proceſſes: but, in man, the cavity forms no part of theſe nerves, but is the ventricle itſelf; while the nerves themſelves are long and ſmall, and without any cavity, paſſing out by the holes in the cribriform portion of the ethmoid bone: they are divided into a number of ſmall filaments which paſs through the numerous ethmoidal holes, and are ſpread very thickly in a reticular manner over the ſurface of the pituitary membrane; giving by theſe means the very great acuteneſs in ſmelling this part poſſeſſes *.

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* Before the human anatomy was ſo well known as it is, the reaſoning upon theſe parts as they appeared in brutes, led to falſe

Second pair, or optic, ariſe in firm cords behind the former, from the two eminences proper to them, called *thalami nervorum opticorum:* paſſing forwards they unite near the pituitary gland, where again ſeparating, they are carried forwards to leave the ſkull by their proper holes in the ſphenoid bone, in company with the occular artery, paſſing from behind forward to enter the orbit when they penetrate the globe of the eye, and are expanded into a fine layer, or web, lining all its inſide to within a little of the edge of the chryſtalline lens, and which expanſion is commonly known by the name of the retina. The peculiarity of theſe nerves uniting, has given riſe to various conjectures. They do not enter exactly in the middle of the globe of the eye, but rather to the internal part, by which it has been ſuppoſed was intended, that viſion might not be obſtructed by the artery, that is ſeen penetrating the very centre of this nerve; but this is now doubted. The exiſtence of this artery has likewiſe been ſuppoſed to account for many ſymptoms that take place in the eyes under diſeaſes; it is alſo thought to be a paralyſis of this nerve that conſtitutes *gutta ſerena.*

falſe concluſions; for, from theſe nerves being hollow, it was ſuppoſed they were emunctories of the brain, by which the ſuperfluous moiſture paſſed off through the ethmoidal holes into the noſe: and this led not only to a great many vague ideas, but to a number of errors in practice: hence all the extended claſs of ſternutories, or ſneezing powders to clear the brain, by ſtimulating the olfactory nerves; which we now know to be uſeleſs.

The third pair, or motores occuli, are ſmall branches, that ariſe from the medulla oblongata near the ſella turcica: they accompany a branch of they fifth pair out of the ſkull, and are diſtributed to the muſcles of the eye, form whence ariſes their name, as being principally concerned in the motions of the eye.

Pathetici, or fourth pair, are likewiſe ſmall nerves ariſing from the cerebellum, near its junction with the cerebrum: they alſo accompany a branch of the fifth pair of nerves, and are ſpent in the oblique muſcles of the eye; from which Willis gives them this name, as expreſſing many of our paſſions.

Trigemini, or fifth pair, are very conſiderable nerves riſing from the annular proceſſes of the cerebellum, and paſſing out of the ſkull in two large trunks, which are the *anterior* and *poſterior maxllary branches*. The anterior maxillary paſſes out of the ſkull by the anterior maxillary foramen, and divides into two branches, one of which is the *opthalmic*, and the other forms the *anterior branch* of the anterior maxillary, while the remaining trunk is the poſterior maxillary. This has given riſe to the terms firſt, ſecond, and third branches of the fifth pair of nerves; each of which branches has numerous ſubdiviſions, which are likewiſe numerically termed: hence in anatomical deſcriptions we frequently read of the firſt, ſecond, and third diviſions of the firſt or ſecond branch of the trigemini. *The opthalmic* enters the orbit connected with the ſixth

pair,

pair, and by a ramus to the olfactory, and is divided into ſeveral branches; one of which paſſes up, and out at the ſuperciliary foramen, and furniſhes the muſcles of the forehead: another branch is given to the lachrymal gland, and two or three others to the parts within the orbit. The anterior maxillary branch gives a ramus that penetrating the palatine foramen is diſtributed to the palate, giving ſome naſal ramifications. The main trunk then entering the anterior maxillary canal, where it furniſhes the molar teeth with ramifications in its paſſage, comes out at the anterior maxillary foramen, and is diſtributed to the muſcles of the lips.

The poſterior maxillary branch goes out of the ſkull at the baſe of the petrous portion of the temporal bone; in this courſe it furniſhes a branch which unites with the intercoſtal, but whether the anterior maxillary furniſhes a ſimilar branch, or whether the parvagum likewiſe unites with it I am not aware: having given off this branch, it divides into ſeveral ramifications. The firſt of theſe forms the *lingualis*, which is diſtributed to the tongue, entering near its baſe; another very conſiderable branch is paſſing by the ſigmoid groove of the poſterior jaw, as we ſhall deſcribe; a third branch is ramified into the ſubſtance of the ſpheno maxillary, and digaſtric muſcles. The fourth principal diviſion furniſhes the parts about the fauces, the amygdala, the ſalivary glands, and molar muſcles. The continuation of its trunk, or one of the principal of theſe diviſions, paſſes along the internal ſurface of the poſterior jaw, and enters the hole in this bone on each branch, called the poſterior maxillary canal; in its paſſage through this canal, in the ſubſtance of the bone, it furniſhes branches to the teeth, and the remainder paſſes out at the foramen, at the ſymphyſis of the ſkin, to be diſtributed to the muſcles of the lower lips, and parts adjacent.

The ſixth, or abducent pair, ariſe from the baſe of the annular proceſſes, paſs with the fifth pair, and enter the orbits to be given to the abductor muſcles of the eye.

The ſeventh pair, or auditory, ariſe from the lateral ſuperior part of the medulla oblongata, dividing each into two portions, one of which is called the *portio mollis*, entering the auditory foramen in a ſoft pulpy form, and diſtributed to all the internal ear. *The portio dura* of this nerve comes out at the baſe of the petrous portion of the temporal bone in a firm cord, part of which is given to the parotid glands, and ſubjacent parts; but the moſt conſiderable portion unites with that branch of the poſterior maxillary nerve we left undeſcribed, when it paſſes over the ſuperior part of the branch of the poſterior jaw, under the cutaneous muſcle, upon the ſurface of the maſſeter, ſometimes in one, at others in two trunks, which dividing in their courſe, ſpread like the ſticks of a fan (*See Plate of the Head*), ſome of which are ſent to the muſcles of the anterior, and the reſt to the parts belonging to the poſterior jaw.

The par vagum, or eighth pair, ariſe from near the baſe of the corpora olivaria, at the extremity of the medulla oblongata in diſgregated fibres, and as they come out of the ſkull they meet and receive each a nerve, which is formed from the ſpinal marrow, and is termed *nervus acceſſorius*. The par vagum, now formed of theſe two nerves, comes out of the ſkull, when either the nervus acceſſorius again parts from it, or a branch is given off from the united trunks of the two nerves, which unites with the intercoſtal, and is then diſtributed to the muſcles and parts about the pharynx and larynx, and upper parts of the neck. The eighth pair then deſcend along the external ſide of the carotid arteries, and as they enter the cheſt give off a branch, called the *recurrent*, from its peculiarity of returning and paſſing up the neck, cloſe to the carotid artery, when it is ramified into the larynx, and is found to be the nerve giving energy to the voice: for if it is divided on each ſide; the animal is completely rendered incapable of making any effort with his voice. Both this nerve and the eighth pair have communications throughout their whole courſe with the intercoſtal, or great ſympathetic, and which unions are forming different plexuſes, which we ſhall deſcrbe with that nerve. After the recurrent nerves are ſent off, the eighth pair are continued with the œſophagus, giving filaments to that and to other parts in their paſſage:

having gained the ſtomach, they are diſtributed on its ſurface, having received branches of the intercoſtal, whereby they form the great ſemilunar ganglion.

The intercoſtal, or great ſympathetic, is a nerve of a peculiar kind, about which anatomiſts differ as to its origin. It is uſually ſpoken of in the ſingular number, though there is one to each ſide: not only is the origin diſputed, but the proper place for deſcribing it: ſome conſidering it as ariſing within the cheſt, and others that it originates from the brain. But till the ſtructure and functions of this intricate ſyſtem is better underſtood, it will not be eaſy to decide: we ſhall, however, conſider it as is moſt uſual, as ariſing from the brain, and deſcribe it accordingly here. This important nerve is called *intercoſtal*, from its ſituation, and *ſympathetic*, from its connection and effects: for it is by means of this nerve, that ſuch extenſive ſympathetic effects are carried on between different parts of the body; which are, however, more obſervable in the human than in the brute, though the anatomical ſituation appears the ſame. The intercoſtal nerve appears to ariſe within the ſkull, and from ſome united branches of the fifth and eighth pair, and probably from ſome rami of ſome of the others: ſoon after its origin, it is forming by its union with the ninth, and ſome of the firſt cervical nerves, the firſt ganglion, which gives branches to the muſcles of larynx, pharynx, and neck. It is then continued down into the cheſt, forming, as it goes, communications with the cervical and vertebral: as it enters the cheſt it forms a ganglion, by which branches are ſent to the heart, uniting with rami given off from the eighth pair. It likewiſe forms, in company with the eighth pair, and with ſome filaments from the dorſal nerves, another ganglion given to the lungs, and parts within the cheſt. After this, paſſing through the left foramen of the diaphgram, it forms in company with the fifth pair, the coronary plexus, which as we have mentioned is diſtributed on the ſtomach, from whence it is continued through the abdomen, furniſhing it by its union with the dorſal and lumbar nerves from numerous ganglions and plexuſes, which are named according to the parts to which the branches of theſe ganglions or plexuſes are ſent, as *the hepatic*, *the ſplenic*, *the great meſenteric*, *the renal*, and *poſterior meſenteric*, and *ſpermatic plexuſes*, by which it will be ſeen how extenſive is the communication of this nerve; nor can we be ſurpriſed at the common conſent the parts muſt act with, when the communication is ſo intimate.

Nervi ſuboccipitales are a ſmall pair ſometimes conſidered as a pair of the ſpinal nerves, at others reckoned as the tenth pair of the cerebrine. They ariſe from the extremity of the medulla oblongata, or beginning of the ſpinal marrow, and paſſing out by the occipital holes are diſtributed to the muſcles of the head and neck.

The

The Spinal Nerves.

The ſpinal marrow is a continuation of the brain, paſſing down enveloped by a ſtrong covering within the great foramen in the vertebræ, giving off on each ſide, as it paſſes a nerve from the holes we have deſcribed, as formed by a notch left in the bodies of each of theſe vertebræ; conſequently the number of theſe pairs of ſpinal nerves correſpond with the vertebræ themſelves, and their names are likewiſe ſimilar. Hence there appears *ſeven cervial, eighteen dorſal*, *ſix lumbar*, and *five ſacral nerves*.

The cervical nerves communicate with each other in their whole courſe, ariſing each by little fillets from the ſpinal marrow, which uniting, form a ſtrong cord. Theſe cords are furniſhing the external and internal parts of the neck and withers; and from ſome of the firſt of them are given off rami, which uniting, form the *phrenic nerve*, that paſſes poſteriorly to enter the cheſt, continuing along the pericardium to be diſtributed to the diaphragm *. The more poſterior of the cervical nerves in conjunction with two or three of the firſt dorſal, and with a branch from the intercoſtal form a large ganglion, which gives eight or nine cords, forming the external and internal humeral, the axillary plexus, and the ulnar. The remaining cords are diſtributed to the muſcles about the withers and ſhoulders, and plentifully to the panniculus carnoſus and ſkin.

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* From this origin of the phrenic nerves, we underſtand why a diviſion of the ſpinal marrow below thoſe vertebræ, from whence they ariſe, does not immediately kill; and why what is termed a broken neck is inſtantly fatal.

The external humeral paſſes down the inner part of the humerus till it is near the bottom of that bone, when it turns towards the outſide of the arm, paſſing down the anterior and outer parts of the cubitus, and is ramified into the muſcles of the leg and foot.

The ulnar (*vid. fig.* 2. *of the Anterior Extremities*) is paſſing over the olecranon on the inner ſide, to be diſtributed to the flexors of the canon and foot, paſſing down with a branch of a vein diſtributed in the ſame manner.

The internal (vid. the ſame figure) paſſes with the artery and vein of the ſame name, over the inner condyle of the humerus, when it takes the name of *radial*, and paſſing in company with the veſſels behind the knee, and under the flexor tendons of the foot, upon the ſuſpenſory bifurcating ligaments, ſtill continuing with the artery and veins, giving branches in its paſſage to the ſurrounding parts, and in this courſe receiving the name of *metacarpal*: it at length divides with the artery and vein into the *paſtern*, or *lateral nerves*, in the ſame manner with thoſe veſſels, and finally ramified into the foot.

The eighteen dorſal nerves are given off from the ſpinal marrow in pairs, through the holes formed by the notches at the extremity of each dorſal vertebra:

tebra: they paſs between the ribs, and communicate freely with each other in their paſſage, whereby reſpiration is aſſiſted: they aſſiſt in forming, by the firſt and ſecond branches, the nerves of the fore extremities; they have likewiſe an extenſive communication with the intercoſtal. In their paſſage they detach filaments that furniſh the panniculus carnoſus, and muſcles of the back; and likewiſe ſome inwardly to be ſpread on the inferior layer of intercoſtal muſcles: thus gradually ſending branches in their paſſage between the ribs, they finally loſe themſelves in the ſurrounding parts; thoſe moſt poſteriorly furniſhing the abdominal muſcles.

The lumbar nerves are ſix pair, given off in the ſame manner as the former, which all communicate with each other, and with the intercoſtal; by which they aſſiſt in furniſhing the viſcera of theſe parts and of the pelvis. The firſt of theſe is communicating with the laſt dorſal, and ſends branches to the muſcles of the back, and internally to the abdominal, to the pſoas, and to the iliac muſcles: the muſcles of the back in general likewiſe, are furniſhed by them. The third, fourth, fifth, and ſixth, unite to form in common with a branch of the intercoſtal, the crural nerve which eſcapes out of the abdomen with the crural veſſels, below the crural arch. There is likewiſe a branch formed, which may be called the *poſterior crural*, or *obturator*, paſſing out of the obturator hole, and furniſhing the obturator, and other muſcles near the great trochanter.

The crural nerve gives branches in its paſſage to the inguinal glands, to the adductors of the femur, and continuing down is principally diſtributed to the muſcles, and parts in front of the thigh: a branch is, however, ſent down ſuperficially on the inner ſide of the leg.

The ſciatic nerve is formed from the laſt lumbar pair, and the firſt three or four ſacral pairs, and is very large, paſſing along the internal part of the ilium, and between the two layers of the ſacro ſciatic ligament. In its paſſage within the pelvis it gives ſome branches; and as it paſſes out, it furniſhes ſome likewiſe to the muſcles of the thigh and ſcrotum, when gaining the poſterior part of the thigh it gives off two conſiderable rami, one of which is divided into the maſſy muſcles of the buttock; the other carries itſelf forward to the front of the tibia.

The popliteal, is the continuation of the ſciatic, and is paſſing between the two heads of the gemini, accompanying the poſterior tibial artery and vein, and is ſeen in this courſe (*vid.* 4. *fig.* 1. *Plate of the Extremities,*) paſſing with the ſame artery and vein in the groove of the calcaneum, accompanying the metacarpal veſſels receiving the ſame name with the *artery* and vein, and bifurcating in the ſame manner with them into the two *paſtern nerves*, which ramify in a ſimilar way with thoſe of the fore extremities.

The ſacral nerves are in pairs, correſpondent to the number of the pieces of the falſe vertebræ of which the ſacrum is compoſed, and are given out by the holes in its ſides. They communicate with the intercoſtal; and the firſt three or four pair are aſſiſting to form the ſciatic nerve on each ſide. The remainder, as well as ſome filaments of the former, are diſtributed to the rectum, anus, bladder, and parts of generation in either ſex. The penis is furniſhed by a conſiderable branch from them in common with one ariſing from the hypogaſtric plexus. *The remainder of the ſpinal marrow*, after this diſtribution, is very inconſiderable; however what does remain, is given out at the extremity of the ſacrum, and is running down the tail in two or three ſmall branches.

SECTION XIV.

Adenology.

GLANDS are vaſcular bodies that are very numerous, and placed over every part of the body. They are of various ſizes, ſome being very large, as the liver, and ſome very ſmall, as thoſe that are termed folliculoſe. *Their figure* is various, and their *ſituation* undetermined; ſome being deep-ſeated and within cavities, others being altogether ſuperficial. The office glands generally perform, appears to be that of *ſecreting* and forming the fluids of the body, or altering the fluids they receive: but in what manner either of theſe actions are produced we are unaware; nor is ſecretion proper to all glands, as is inſtanced in the thyroid, which does not ſecrete: other parts again ſecrete, that appear to have no glandular ſtructure, as the capſular ligaments. The diviſion of the glandular ſyſtem is by no means definite among authors; ſome dividing them according to their appearances, others according to their uſes. The uſual method is compounded of theſe. Glands are, therefore, uſually divided into *folliculoſe*, *globate*, *glomerate*, and *conglomerate*; though the folliculoſe are but a ſmall ſpecies of glomerate. Glands are likewiſe receiving names individually, according to their office, as the *lachrymal*, *ſalivary*, &c. The *follicular* are ſmall glandular bodies variouſly diſperſed, and appear either *ſebaceous* or *muciparous*, The *ſebaceous glands* are moſtly ſituated on, or near the ſurface of the body, and appear compoſed of ſmall arterial convolútions, by which a ſubſtance is formed, having ſome degree of ſolidity, and reſembling ſuet, hence called ſebaceous. *Muciparous glands* are deſcribed as ſmall follicular bodies, uſually ſituated in cavities and canals; ſecreting a mucus; as that of the noſtrils, fauces, and urethra: but in many inſtances they are not very evident, and in ſome mucous membranes their exiſtence even is doubtful. *Globate glands* are oval vaſcular bodies, receiving lymphatic veſſels at one ſide, and permitting their exit at the other; but are deſtitute of any other excretóry trunk, hence they are deemed peculiar to the lymphatic ſyſtem. *A glomerate gland* appears one connected body of an indefinite ſhape, with an excretory duct; as the kidney, liver, &c. *A conglomerate gland* is a body compoſed of ſeveral glomerate glands, each of which has its proper excretory duct, going to form a large general one common to the whole, whereby the gland is connected, as well as by the cellular membrane; ſuch are the ſalivary and pancreas. There does not ſeem to be any eſſential difference in the œconomy or functions of the glomerate or conglomerate glands; the convenience of ſituation appears to be ſtudied more than any varieties in their office; hence ſome early in life are conglomerate that in the adult become glomerate, as the kidney in the human infant. In the bear the kidney remains always a conglomerate gland. The glands of young ſubjects are ſaid to be larger than thoſe of older; and from the alteration in the kidney and thymus gland, we ſee that ſome change is really taking place both in their ſize and figure during life. The nerves of glands are ſaid to be few, and hence their ſenſibility is not conſiderable; they are however plentifully ſupplied with blood veſſels, and this uſually in proportion as they are intended to ſecrete more or leſs; hence the veſſels of the kidneys are very large. The blood uſually is retarded in its courſe through glands by the ſtructure and ſituation of their veſſels: thus their arteries are uſually convoluted, and have a greater proportion of muſcular than elaſtic coat, and their veins are without valves; by which formation the blood remains a longer time within the gland, to be more compleatly acted upon. All the ſecreting glands perform their ſecretion from arterial blood, but the liver, which ſeparates its fluid from venous.

Many opinions have been formed on the ſubject of *glandular ſecretion.* It has been thought, that the immediate formation of the ſecreted ſubſtance depended on its previous exiſtence in the blood; and that the glands only ſtrained, or otherwiſe ſeparated theſe component particles. But it does not appear probable that the blood can contain theſe various ſecretions in their natural ſtate: ſome of them we know cannot ſo exiſt, as bone and horn, which are both of them ſecreted ſubſtances. The blood poſſeſſes the ſame chemical properties throughout; it therefore muſt be a living act of the glands themſelves, or of the veſſels within the glands: this opinion is farther ſtrengthened by the various phenomena of vegetation; ſap owns the ſame chemical properties likewiſe, yet forms by the medium through which it paſſes, or it is convertible into, wood, bark, leaves, bloſſoms, and fruit. That this proceſs is an effect of the glands themſelves on the blood, is yet more evident from the various ſecretions being formed from thoſe differing ſenſibly in ſtructure from each other; and this has led into an examination into this ſtructure, both general and particular, but from which little has been learned by the moſt diligent reſearch. Ruyſch made many experiments, and from his minute injections, he was induced to believe that every gland was a ſeries of veſſels, which after being convoluted throughout its ſubſtance, terminated in an excretory duct. Malpighi, after his enquiries, gave it as his opinion, that in every glandular body there is one or more arterial trunks entering, which ramifies very minutely through its ſubſtance; and which minute ramifications terminate in a cavity, from whence an excretory duct is ſent out. Numerous other inveſtigations have been undertaken

taken, and theſe organs examined under every variety of circumſtance; but their particular ſtructure has hitherto eſcaped detection, and probably for ever will.

Glands are endowed with a ſmall ſhare of ſympathetic effect; the kidneys form one of the ſtrongeſt and moſt notorious inſtances of this, whoſe ſympathy with the ſkin is very great; thus when one acts in profuſion, the other is leſſened in its ſecreting effects. In ſummer when the ſkin is in full action, and the blood is pouring out its aqueous particles in this way in great plenty, little urine is made: but in winter the reverſe takes place. The diſeaſe, called the mumps, in the human, forms a ſtrong inſtance of glandular ſympathy; in which, in the firſt inſtance, the affection rages in the parotid, or ſubmaxillary glands; but towards the cloſe of the complaint, one or both teſticles uſually become affected. As the circulation through a gland is increaſed, ſo is the ſecretion increaſed; more blood being by this means determined to the organ, more is acted upon; hence under the firſt ſtages of inflammation, glands ſecrete more, becauſe the circulation is increaſed; but in the latter ſtages of inflammation, or when it exiſts in a great degree, the ſecretion is leſſened, or totally ſtopped: for not only have the veſſels taken on probably a peculiar ſtate, but the gland itſelf is probably become, in a meaſure, diſorganized, and unfitted for its functions.

The ſecretions of the horſe may become diſeaſed in their chemical properties: they may likewiſe experience a preternatural increaſe, or decreaſe; hence it is evident, this ſyſtem in this animal may take on diſeaſe; the varieties and effects of which will be met with when we enter on the practical part of the art: but ſcrofulous and cancerous affections are not frequent in this animal.

Of particular Glands.

Glands of the ſkin. There are uſually conſidered little glandular bodies diſtributed over the ſurface, within, or under the ſkin, termed *ſubcutaneous glands*; which are forming a matter that is furniſhing the external ſurface of the body with a matter of a greaſy nature, and is that which on rubbing a horſe's ſkin, makes the hands appear moiſt and greaſy. When this is ſecreted in plenty it is a ſign of health, but when the ſkin and hair is dry, it is unfavourable; or, perhaps, it would be more correct to ſay, that under ſome diſeaſes, when the ſecretions are either ſuſpended or altered, this among the reſt becomes faulty; and the hide is, among farriers and horſemen, ſaid to be unthrifty; feeling dry to the touch, and harſh, as well as giving a diſpoſition to the hair to ſtare.

Glands of the Head.

There are ſeveral glands in the cavity of the ſkull, or at leaſt ſubſtances that are eſteemed glandular; ſuch as thoſe of the dura mater, thoſe within the choroid plexus, &c. The *pineal gland* is a ſoft greyiſh body, ſituated above the *thalami nervorum opticorum*, and was by ancient anatomiſts regarded as the ſeat of the ſoul: but though the moderns reject this idea, yet to them its uſe is equally unknown. *The pituitary gland* is a ſpongy body about the ſize of a cheſnut, lodged within the *ſella turcica*, at the poſterior part of the brain, whoſe uſe is likewiſe unknown.

The lachrymal gland is ſituated within the orbit, at the ſuperior part of the external angle of the orbitary foſſa; it is a glomerate gland furniſhed with ſeveral little excretory ducts, which ſecrete a fluid that aſſiſts the eye in its motion, called the *tears*.

The caruncula lachrymalia, is a ſmall eminence placed at the ſide of the grand or internal angle, furniſhed with little excretory ducts, from which iſſues a peculiar fluid.

Meibomius's glands, are ſmall ſebaceous glands, ſituated under the inner ſkin of the eye-lids, with their excretory ducts opening on the tarſi or edges of the eye-lids, and are called *puncta ciliaria*; they furniſh a ſebaceous matter to theſe parts, which is ſometimes diſeaſed in inflammation of the eye in the

human,

human, and ſolders them up as it were, but are ſeldom affected in the horſe.

Glands of the membrana nictitans are deſcribed as ſmall bodies, with open orifices on this cartilaginous ſubſtance.

Glands of the noſtrils are ſaid to be ſmall muciparous glands within the pituitary membrane, throwing out a mucus, whereby this ſurface is kept moiſt, and which appears very favourable to the proper ſenſibility of the nerves, and is hence found in moſt ſurfaces of exquiſite ſenſe: by which likewiſe it is probable, the effluvia is arreſted in its courſe, and more permanently applied to the nerves: thus, in ſome caſes, we perceive the ſmell of ſubſtances long after the ſubſtances themſelves are removed. In the glanders if, as it is ſaid, the naſal fluids are ſecreted from theſe deſcribed bodies, they probably become inflamed; as in that diſeaſe the diſcharge is altered from its natural ſtate: but, perhaps, the exiſtence of theſe glands in many parts, where they are uſually deſcribed, is to be doubted. *Ceruminous glands of the ear.* The inſide of the ears are furniſhed with numerous ſmall glands, which ſecrete a waxy ſubſtance, whereby inſects and duſt are prevented from making their way to the membrana tympani.

Parotid glands are two conſiderable bodies ſituated on each ſide of the head, beginning at the baſe of the ear anteriorly from the zygomatic arch, (*ſee Plate* IV.) running around to the poſterior part of it: inferiorly it has a triangular proceſs, that runs on the upper branch of the jugular, and another portion fills up the triangular ſpace between the upper and lower branches of this vein. It is a gland of the conglomerate kind, receiving little ducts from its ſeveral portions, which all run into one conſiderable trunk that runs on the anterior edge of the gland, along the tuberoſity of the poſterior jaw: within the inner ſurface of which it runs down to the extremity of the tuberous ridge, when it comes from the inner ſide to the outer, and paſſes up in company with the maxillary artery and vein, and pierces the muſcles of the mouth, about the ſecond molar tooth. Theſe glands are called *vives* among farriers, and any ſwelling in them is termed the ſame. Thus, if in any ſuch caſe, they proceed to maturation, and are opened; but which can only be neceſſary when their very great increaſe, and their proximity to the trachea may impede reſpiration; when this becomes neceſſary, it is evident, it ſhould be carefully avoided opening them near the anterior part where the duct runs, or the ſaliva will not only be loſt to the mouth, but the ſore will be rendered troubleſome and difficult to heal, becoming fiſtulous. From what has been ſaid, it is unneceſſary to add, theſe glands are intended to furniſh part of that diluting fluid termed ſaliva.

The maxillary are two conſiderable glands of ſeveral inches in length, ſituated within the branches of the poſterior jaw, their upper part being near the condoloid proceſs of that bone, and their lower pointed extremity, being at the angle, or rather beyond it; ſuperiorly, being juſt within, and under the parotid glands. Their ducts paſs one on each ſide, under the milo hyoideus muſcle, and under the tendon of the digaſtric, and are penetrating the membrane of the mouth, about an inch and a half from the lower nippers, by an orifice proper to each, which projects up into a nipple-like riſing. (*Vid. Plate* III. *fig.* 2. *n n.*) In inflammations of the mouth, it is common with ignorant farriers, to miſtake theſe for injurious and foreign bodies, and to cut them off, whereby they uſually occaſion a very ſerious complaint. Perſons ſhould be very careful how they retail the errors of others, eſpecially thoſe whoſe tendency is pernicious. Mr. J. Lawrence, in his publication, recommends cutting the *barbs*, or *paps* cloſe, (which are the extremities of theſe ducts,) and which is evidently a moſt dangerous practice (*page* 490, *vol.* ii.).

The maxillary lymphatic glands are ſituated at the ſuperior part of the branches of the poſterior jaw under the ſkin: they pour their lymph into the cervical glands. La Foſſe miſtakes theſe, and which has thrown him into great error in his deſcription of the glanders.

The ſublingual glands are ſituated lower than theſe: their excretory duct penetrates the mouth at the lateral inferior part.

The labial glands are placed under the common membrane of the mouth on the inner ſurface of the lips, and are ſmall folliculoſe bodies.

The molar glands are on each ſide of the mouth, near the alveolar edge; and are ſmall bodies, whoſe excretory duct opens near the laſt molar teeth.

There are likewiſe glands placed within the mouth, at its poſterior part under the membranes. The tonſils themſelves are glandular bodies. There are beſides others, between the membrane of the velum palati, and ſome within the membrane of the palate itſelf, as well as ſome termed *laryngeal* and *pharyngeal.*

Glands of the Neck.

The thyroid is a large gland placed one on each ſide of the trachea anteriorly, immediately below the larynx. Its excretory duct has never been detected, and its uſe is unknown.

Beſides theſe, the neck is furniſhed with ſmall lymphatic glands in different parts.

Glands of the Thorax.

The thymus is a large gland, called by butchers the *ſweet-bread*, and is ſituated within the mediaſtinum, at the ſuperior and anterior part of the cheſt. Lymphatics have been ſeen on it going to the thoracic duct; but no excretory canal has ever been found. In the colt, and moſt young animals, it is very large; but in adults it becomes dwindled almoſt to nothing: hence we eat veal ſweetbreads, but we never meet with thoſe of beef. Its uſe is a matter of uncertainty.

The bronchial glands are two large dark glandular bodies placed near the bifurcation of the trachea, and which are thought to ſecrete a humour to furniſh the bronchia.

The dorſal are deſcribed as two glands, ſituated in the cheſt, near the aorta, at the fourth or fifth dorſal vertebra, whoſe excretory ducts have not been found, and whoſe uſes are therefore doubtful.

Glands of the Abdomen.

The gaſtric, which are muciparous glands, diſcovered by Morgani, are ſaid to be placed under the external membranes of the ſtomach; but whoſe exiſtence is, by ſome, eſteemed doubtful, and the appearance fallacious.

The inteſtinal glands are ſimilar bodies under the internal membrane of that canal.

The meſenteric are the globate glands of the meſentery (*which ſee*). *The lumbar glands* are ſituated in the lumbar region, and belong to the lymphatics.

The iliac and *ſacral*, are lymphatic glands placed in the parts from whence they derive their name.

The *liver*, the *pancreas*, the *kidneys*, are all large abdominal glands, whoſe ſtructure will be deſcribed under *ſplanchnology*.

The renal glands are bodies ſituated at the anterior extremity of each kidney, whoſe uſe is unknown, and whoſe duct has never been diſcovered. *See Splanchnology*.

The ſpleen is by ſome conſidered as a glandular body; but its duct has never been demonſtrated; and from its office being apparently to aſſiſt in digeſtion, it is not properly ſo conſidered. *See Splanchnology*.

Glands in the Male Organs of Generation.

The odoriferous glands of the glans penis. Theſe are ſebaceous glands ſecreting a ſuety matter at the head of the yard, under and within the prepuce or ſheath: when this has remained in too great quantities for any conſiderable length of time, it may occaſion inflammation and ulceration.

Glands of the urethra are mucous glands, ſituated under the membrane of that canal, whoſe orifices within it are called lacunæ. It is an inflammation of theſe in the human, that has been ſuppoſed to form gonorrhœa: but it is not an inflammation of them that conſtitutes a mattering of the yard in the horſe: it is more uſually ariſing from the external ſurface of the glans penis; though at times it may proceed from inflammation and ulceration of the inner membrane of the bladder or urethra.

The proſtrates are glandular bodies ſituated near the membranous part of the urethra. *See Splanchnology.*

Cowper's glands are ſituated at the external part of the urethra below the former, opening by ſeveral ſmall orifices into that canal; being externally muſcular, and internally hollow.

The veſiculæ ſeminales are two bodies, now ſuppoſed to be glandular, whoſe office it is conjectured is not to receive the ſemen, but to ſecrete a fluid to dilute it.

The teſticles are two glandular bodies, ſituated within the ſcrotum, ſecreting the ſemen; this excretory duct penetrates the urethra by the veſiculæ ſeminales. *See Splanchnology.*

Glands of the Female Organs.

The odoriferous glands of the vulva and clitoris, are ſimilar ſebaceous glands to thoſe of the male prepuce.

The glands of the urethra are ſituated within its inner membrane.

The mammary glands are a collection of numerous glandular bodies, divided into two portions. Each portion has a number of lactiferous tubes, which end in two teats, by which the milk, which is ſecreted within them, can be drawn out by the foal in the act of ſucking. *See Splanchnology.*

Glands of the Extremities.

The axillary are numerous globate glands, collected into a maſs of an oblong figure, ſituated at the anterior lateral external part of the cheſt, laying cloſe to the axillary veins: they are united together by cellular ſubſtance, and are receiving the lymphatics of the anterior extremity, and ſome of thoſe of the neck.

The ſubſcapulary are likewiſe lymphatic glands, ſituated at the internal ſurface of the ſcapula, receiving the lymphatics of thoſe parts.

The inguineal are globate lymphatic glands, ſituated within the thigh, being larger than the axillary, and not ſo circumſcribed in their figure, nor ſo intimately connected; but extend more down the thigh, within that part called the groin in the human. They receive the lymphatics of the groin, and both theſe and the axillary may become inflamed in greaſe, or other ſores producing a diſcharge, whoſe abſorption will irritate them.

END OF THE FIRST VOLUME.

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